DOCUMENT RESUME

ED 235 099 SO 015 029

AUTHOR Schenk, Robert E.
TITLE Two Simple Macroeconomic Simulations and the Great Depression. Instructor's Notes [and] A Student Guide [and] Basic Program.
INSTITUTION Saint Joseph's Coll., Rensselaer, Ind.
SPONS AGENCY National Science Foundation, Washington, D.C.
PUB DATE 80
GRANT SER78-00065
NOTE 112p.; Basic Program may not reproduce well due to marginal legibility.
PUB TYPE Guides - Classroom Use - Materials (For Learner) (051) -- Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS *Computer Assisted Instruction; *Economics Education; Higher Education; Instructional Materials; Introductory Courses; *Models; *Simulation
IDENTIFIERS *Depression (Economic 1929); Keynesian Economics; *Macroeconomics

ABSTRACT

Intended for use with college students in introductory macroeconomics or American economic history courses, these two computer simulations of two basic macroeconomic models--a simple Keynesian-type model and a quantity-theory-of-money model--present largely incompatible explanations of the Great Depression. Written in Basic, the simulations are intended to help students learn the mechanics of basic macroeconomic models and to help them see that disagreement is common among economists because, often, it is hard to decide which theory best explains the facts. To successfully complete the assignments, a student must understand such concepts as the multiplier principle and the velocity of money well enough to apply them. The teacher's guide includes a discussion of the models, describes how to use the simulations, and contains discussion questions and the programs themselves. The student guide contains background information, student instructions, review questions, self tests, suggestions for further reading, and two introductory programs that allow students to test themselves to see if they are ready to proceed to the simulations. (Author/RM)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

BEST COPY AVAILABLE

ED235099

Two Simple Macroeconomic Simulations and the Great Depression. Instructor's Notes [and] A Student Guide [and] Basic Program.

Robert E. Schenk

1980

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☒ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Robert E. Schenk

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

SO 015 029

TWO MACROECONOMIC SIMULATIONS OF THE GREAT DEPRESSION

(macroeconomics)
Suggested Courses: Introductory Macroeconomics, American Economic History

Interactive BASIC

The simulations in this package are of two basic macroeconomic models, a simple Keynesian-type model and a Quantity-Theory-of-Money model. Each simulation tracks an actual episode in American economic history, the period from 1929 to 1940.

The major purpose of these programs is to help students learn the mechanics of basic macroeconomic models. A student plays the role of either a fiscal or monetary policymaker, depending on the simulation. To successfully complete the assignments in the Student Guide, a student must understand such concepts as the mutiplier principle and the velocity of money well enough to apply them. An important secondary purpose is to help students see that disagreement is common among economists because often it is hard to decide which theory best explains the facts. The simulations present two largely incompatable explanations of the same series of events, and both explanations have advocates.

Included in the package are two introductory programs that allow students to test themselves to see if they are ready to proceed to the simulations.

How These Simulations Differ from Other Macrosimulations

The computer simulations that are contained in this package differ in several ways from most existing macroeconomic simulations. They are simpler than most other macroeconomic simulations, they use real-world rather than fictional data, and they present two alternative views of how the world works.

Simple simulations are easier to understand than complex simulations because simple models are easier to understand than complex models. This is the reason that introductory courses teach theories in simple forms. Simple theories are presumably cruder approximations of reality than more complex theories, but if a theory is a good theory, it should have something to say even in a simple form. The simulations in this package not only allow students to learn about simple forms of Keynesian and Quantity Theory models, but also invite them to investigate whether these models do have anything important to tell us.

The use of real-world data has several important advantages. It allows students to see that economics may have important things to say about the past. The era of the Great Depression is an especially important episode because it is an event that cries out for explanation. Keynesian theory had its rapid development because it claimed to explain events which seemed inexplicable in terms of classical economics. One could date the revival of monetarism as starting in 1963 when Milton Friedman and Anna Schwartz showed that the Depression could be explained in monetary terms. Certainly no macroeconomic theory can be taken

seriously if it cannot adequately explain why the events of this period existed.

A second advantage of using real-world data is that it introduces students to a problem usually left to upper division courses: how can we tell if a theory is valid. Further, by setting two conflicting theories side by side, students are invited to view scientific theories in the way Karl Popper says that they should be viewed, as conjectures in search of refutation. (See Karl R. Popper, Conjectures and Refutations: The Growth of Scientific Knowledge, New York, Basic Books, 1962). The students can see that these two simple models both predict about equally well in the 12 years simulated and should wonder, especially if prodded by the instructor, how one can choose between them. For example, would tracking the simulations into the 1940s tell us anything? Are the 40s a period so exceptional that it cannot be used , or is it the sort of exceptional period which we should seek to test theories? (To see what happens in the 1940s, see question 12 in the Student Guide and comments about it below.) Though a complete discussion of testing theories requires a knowledge of statistical procedures, an intuitive view of the issues involved may be developed using these simulations.

A problem that is avoided when using real data is the question of whether to include a random distrubance in the model. Some authors of fictional-data simulations have a random disturbance to make the simulation more "realistic". The cost of this inclusion is that the model becomes much more difficult for students to understand. With real data the model can be simpler, and students can see that the real world is more complex than the model by comparing simulated and historical results.

After running these simulations, students should have a clearer idea of why controversies can persist among macroeconomists. Not only will they be asked to understand positions on two sides of a controversy, but they should begin to see that it can be difficult to empirically decide between alternative positions.

Notes on the Models

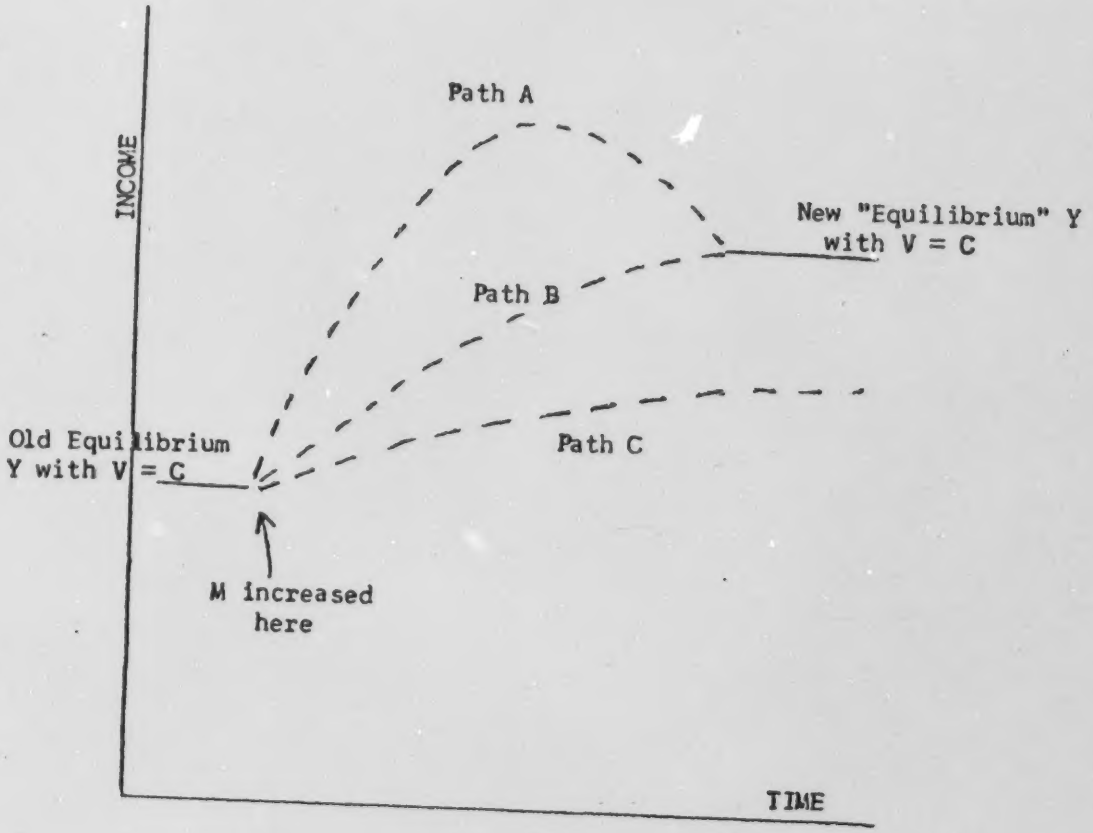
The models are shown in all their simplicity in the sample runs in the Student Guide. Sources of data are given in the Remark statements in the program listings. A couple of points deserve comment. The reason that the multiplier in ECK2 is three is that it gave better results than any other integer and an integer kept the model simple. In ECM2 velocity is not a constant but a variable that can change. Though many textbooks insist that the Quantity Theory must have a constant velocity, few if any Quantity Theorists ever did. Further, many texts which stress that there is a short-run relationship between money and velocity ignore the fact that the relationship is direct, not inverse. This means that cyclical changes in money are not offset by changes in velocity, but tend to be amplified by it.

The proposition that M and V are directly related may surprise some because for many years the assertion that M and V were inversely related was used to attack the Quantity Theory. The theoretical argument maintained that an increase in money stock decreased the interest rate, and a decrease in interest rate would decrease velocity, partially or totally offsetting the increase in money. (Everything is reversed for a decrease

in money.) Since several economists who first reviewed this package objected to the assertion that M and V could be directly related, I believe that a detailed explanation is needed at this point.

The usual argument that M and V are inversely related dates back to the Depression and was used as a way of attacking the Quantity Theory. Though by now it should be considered an empirical issue, as a theoretical argument it rests on crucial ceteris paribus assumptions. If an increase in money changes income or price expectations, interest rates may increase, not decrease, and the inverse relationship may not appear. Attacks on the monetaist position no longer center on the behavior of velocity, but on the question of to what extent money causes changes in business activity and to what extent business activity appear. (For an example of an empirical study which casts doubt on traditional assumptions about these relationships, see Frederic S. Mishkin, "Monetary Policy and Long-Term Interest Rates: An Efficient Markets Approach," NBER Working Paper 517. Mishkin finds no evidence that increases in money stock depress long-term interest rates.) Attacks on the monetarist position no longer center on the behavior of velocity, but on the question of to what extent money causes changes in business activity and to what extent business activity causes changes in money.

The empirical question is one of short-run and long-run adjustment. The graph below illustrates a series of possible adjustment paths. Path C is a path in which a change in M has a long-run, inverse effect on velocity. In both paths A and B there is no long-run relationship between M and V. In the short run path B predicts an inverse relationship between



M and V. The inverse relationship appears because there is a lag between the change in M and the change in GNP. Path A predicts that initially M has little effect on income, then income overshoots its equilibrium value in the adjustment process before settling down to its equilibrium value. Thus there is a period in which there is a direct relationship between M and V because for a time the change in M had more than a proportional effect on GNP.

Relatively little work has been done examining the short-run movements in velocity. Conclusions from demand-for-money studies are difficult to interpret in terms of what they imply for velocity because the variable they explain is <u>real</u> balances. However, even a cursory looks at the data shows that

both money and velocity tend to rise faster than trend during upswings of business activity and to fall or increase less rapidly than trend during downswings. The parallel movement results in a positive correlation. Another way to see the relationship over the business cycle is to examine page 61 of The Velocity of Money by George Garvy and Martin R. Blyn (Federal Reserve Bank of New York, Second revised printing, 1970). For an example of the Friedman-Schwartz findings on velocity, see pages 302-3 of their Monetary History. Finally, for evidence that velocity may have an adjustment path such as Path A in the graph above, see Keith M. Carlson, "Money, Inflation and Economic Growth: Some Updated Reduced Form Results and Their Implications," Federal Reserve Bank of St. Louis Review, April 1980, table 2.

I have considered the terms "monetarist" and "quantity theorist" as equivalent. The major distinction one could draw between them would be one of date. Thomas Humphrey, in his 1974 article mentioned in the Student Guide writes: "Today the quantity theory survives and flourishes in the doctrines of the so-called monetarist schools emanating from such institutions as the University of Chicago and the Federal Reserve Bank of St. Louis" (p.2). ~~And~~ That rather than changes in the view of how the world works, later, he writes: "Since the classical period, most of the improvements in the theory have consisted of its periodic and increasingly rigorous reformation in order to conform with the latest innovations in economic theorizing or to meet the increasingly severe standards of empirical testing." (p. 17). Boris Pesek notes that Irving Fisher's theory was as sophisticated as the modern versions of the quantity theory, a fact overlooked in almost all textbook descriptions of the "old" quantity theory. (See his "Monetary Theory in The Post-Robertson 'Alice in Wonderland' Era," Journal of Economic Literature, September 1976, pages 857-9.

The models are presented as equilibrium models because this form is easiest to discuss. The formulation of the Quantity Theory in ECM2 with a variable velocity can either be viewed as an incomplete short-run equilibrium model or as a peculiar long-run model. (For a good discussion of various types of equilibrium models and their relationship to dynamics, see Axel Leijonhufvud On Keynesian Economics and the Economics of Keynes (Oxford University Press, 1968), pp. 50-52.)

The equations that generate unemployment and inflation are as simple as the rest of the models. Both unemployment and inflation depend on the size of the gap between potential and simulated GNP; sometimes inflation also depends on the speed at which GNP is changing. There is an asymmetry in the inflation equation; inflation increases more readily than it decreases. I used these equations because they provided plausible results, not because I think they are a good theory of inflation and unemployment.

The equations are:

(1) Potential Output = 100 x price index x 1.03^t

The 100 represents approximately full GNP in 1929 prices.

(2) Price Index$_t$ = Price Index$_{t-1}$ + inflation

(3) $$\text{Unemployment} = 55\frac{(\text{Potential Output} - \text{Simulated GNP} + 2.5)}{\text{Simulated GNP}}$$

If simulated GNP is decreasing from the last period, then

(4) $$\text{Inflation} = .3\frac{(\text{Simulated GNP}_t - \text{Potential Output})}{\text{Potential Output}}$$

If simulated GNP is increasing from the last period, then

$$(5)\quad \text{Inflation} = .35\left(\frac{\text{Simulated GNP}_t - \text{Potential Output}}{\text{Potential Output}}\right) + .25\left(\frac{\text{Simulated GNP}_t - \text{Simulated GNP}_{t-1}}{\text{Simulated GNP}_{t-1}}\right)$$

If the instructor wants to stop the printing of the unemployment, inflation results and the various comments, a single change in each program will suppress them.

The Student Guide mentions that many explanations of the income-expenditure approach are in terms of real variables. The only difference between using real and current values comes in the consumption function. With nominal data it is

$$C = a + bY.$$

With real data it is

$$C/P = a + bY/P$$

which, if we multiply through by P, yields

$$C = aP + bY.$$

The difference in behavior is that the nominal-consumption function assumes money illusion and the real-consumption function does not. The distortion caused by using nominal data instead of real data is small if either a is small relative to bY or if price movements are small. Because in the 1930s and 1940s this distortion is insignificant, I felt that any cost of using nominal data was far outweighed by the advantage to student understanding of having simple theories both explaining the same thing. To quote Bagehot, "To illustrate a principle, you must exaggerate much and you must omit much."

Other Ways of Viewing the Theories

Macroeconomics involved the aggregation of many goods and services into a few catagories. This fact and Walras' Law (there is some controversy about how Walras' Law is related to Say's Law or Say's Principle) allow us to approach the problems of macroeconomics from a fresh -- nongraphical -- perspective.

Assume (where else do economists start) that people do not work for the sake of working. Also assume that we have a three person, three good (fish, coconuts, and rice) economy. The fisherman spends time fishing only because he wants to consume some of his fish and because he wants to obtain coconuts and rice through trade. In other words, he supplies fish only because he has demands, or supply immediately gives rise to demand. In symbols we can represent this idea in this way:

$$S_F = D_F^a + D_R^a + D_C^a$$

where the term D_F^a represents the demand of individual a (the fisherman) for fish. The coconut gatherer and the rice farmer act in a similar manner, or:

$$S_R = D_F^b + D_R^b + D_C^b$$

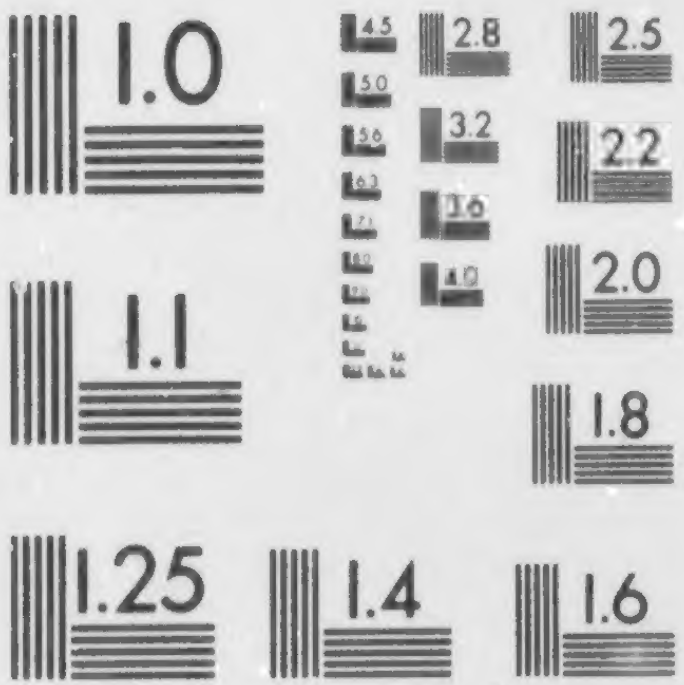
and

$$S_C = D_F^c + D_R^c + D_C^c$$

Say's law (or principle?) says that if we add up the supply-side of the equations, we will get the same as the sum of the nine demand terms on the right. Walras' Law says that if

$$S_F = D_F^a + D_F^b + D_F^c \text{ and}$$

$$S_R = D_R^a + D_R^b + D_R^c$$



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS
STANDARD REFERENCE MATERIAL 1010a
(ANSI and ISO TEST CHART No. 2)

then

S_t must equal $D_C^a + D_C^b + D_C^c$

Put in other words, if there are n markets and n-1 are in equilibrium, the nth must also be in equilibrium.

According to Say's law, individual markets could be out of equilibrium, but if one item was in oversupply, another was overdemanded. In the early 19th century this idea was used to attack underconsumptionism with considerable success.

Macroeconomics often aggregates items into the four classes shown in the table below. A negative sign indicates that the transactor is supplying an item and a positive sign indicates the transactor is trying to acquire or demanding the item. The column "money balances" is a residual column in the sense that if the person is offering more of other items than the person is demanding, money balances are expected to rise. In the table as constructed, all markets are out of equilibrium, but changes in prices should cause adjustment. When a market is in equilibrium, it will sum to zero. Rows must sum to zero by assumption.

The point of all this is that further aggregation is possible. If one believes that the major source of instability rises in the goods

****

		MARKETS				
		Goods and Services	Labor	Non-money Debt and Equity	Money	Total
TRANSACTORS	A	4 (demanding a product)	-6	-8 (borrowing or supplying debt)	-2	0
	B	-7	8 (demanding labor)	4 (saving or supplying debt)	-5	0
	C	7	-5	-2	0	0
		4	9	-6	-7	0

and services markets, then the other three sectors can be consolidated and ignored by Walras' law. One need only analyse what happens in the markets for goods and services, which is what the simplest forms of income-expenditure models do. If one believes the predominant source of instability is in the supply and demand for money balances, then one can consolidate the other three markets and ignore them by Walras' law, which is what the simple versions of the quantity theory do. If one believes instability can come from several places, then one needs more complex models and perhaps will find the amount of aggregation in the above table excessive.

For further discussion of Say's law and this approach, see Thomas Sowell, Say's Law: An Historical Analysis (Princeton: Princeton Univ. Press, 1972); Axel Leijonhufud, On Keynesian Economics and the Economics of Keynes: A Studey in Monetary Theory (New York: Oxford Univ. Press, 1968); and at the textbook level, Charles W. Baird, Elements of Macroeconomics St. Paul, West Publishing Company, 1977), chap 3.

Rather than this approach, some textbooks are shifting to an aggregate supply-aggegate demand (AS-AD) approach. A couple of points are worth noting in considering this approach.

First, it represents a second attempt to use the supply-demand type of model as the basis of macroeconomics; ISLM was the first. The structure of ISLM is identical to the structure of supply and demand, and I suspect this accounts for much of its popularity.

Second, the AS-AD appraoch is hardly new. One can find a similar approach presented in Sidney Weintraub, Classical Keynesian Monetary Theory and the Price Level (Philadephia: Chilton Company, 1961). Weintraub argued that the simple, 45° Keynesian model presented in traditional textbooks was so defective that it was utterly irrelevant to real-world problems. Weintraub presented an AS-AD model to replace the 45°-line model, not to supplement it as some texts are now doing. The problem with Weintraub's approach is that it eliminates the multiplier. The multiplier flows so nicely from a critical-mass model -- which is what the 45°-line model is -- that those texts using AS-AD also keep the 45°-line model.

Third, though the AS-AD approach is being combined with the simple income-expenditure model, it actually is easier to develop from a quantity-theory model. In their pure forms, the Kncome-expenditure model appears as Figure2 and the quantity theory as Figure 3.

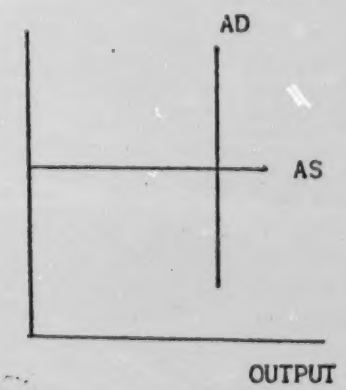


FIGURE 2

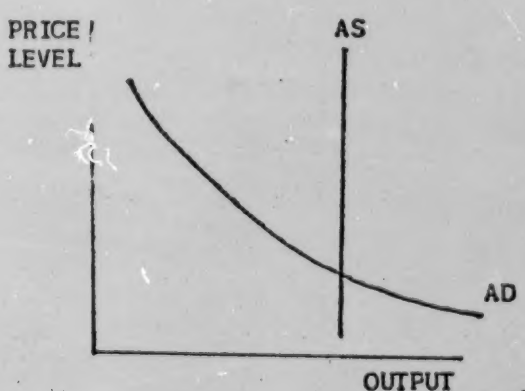


FIGURE 3

If all variables are real in the income-expenditure model, the AS curve is horizontal and the AD curve is vertical (see the discussion in the previous section). Real output is exogenous in the long-run quantity theory, and

hence the AS curve is vertical. Total spending is a constant (MV), so the AD curve is a rectangular hyperbola. To move from Figure 3 to a more usual AD-AS graph, one need only assume that short-run changes in total spending may affect output as well as prices. The exact assumptions one needs to get from the simple income-expenditure model to AS-AD are not clearly explained in any of the textbooks using this approach.

Finally, the AS=AD approach can explain any combination of price and output. It takes not risks. This should be seen as a weakness, not as a strength.

Using the Simulations

Simulations require coordination with what happens in the classroom. The instructor must prepare students for a simulation and must also follow up a simulation to help slower students understand what happened in the simulation. If students are simply turned loose on a simulation, many will obtain only frustration and confusion. The instructor must guide their encounter with the simulation and tell them what they are supposed to be looking for. This conclusion about the need to integrate simulations into the flow of the course has been found by others in addition to the author. See for example, William I. Davisson and Frank J. Bonello, Computer-Assisted Instruction in Economics: A Case Study (Notre Dame Press, 1976), p. 108.

I have tried to use the simulations in a variety of ways, and those which I have had most success with are contained in the Student Guide. Most students who have used the simulations are freshmen with SAT scores at the national average. They are not able to immediately begin with an assignment such as Investigation #3, which requires them to stabilize GNP with fiscal policy. There are too many steps in the process: find the multiplier, decide what target GNP should be, compute the amount by which GNP must increase to hit target, decide how much additional government spending is needed to bring that about, and add the addition onto the existing government spending. Application of concepts and theories involves a higher level of learning than that which many students are used to attaining. (See Benjamin S. Bloom, ed., Taxonomy of Educational Objectives, (New York, McKay, 1956). Because my

students could not do this assignment without help, two preliminary assignments, Investigations #1 and #2, are in the Student Guide to help them prepare for this assignment.

Overall I have been very pleased with the response students have made to these assignments. At the time I am writing this, about 240 students taught by two instructors have worked through the Student Guide. They have attacked the material with more enthusiasm than complaint. Because some have difficulty with the assignments, I have announced times when help would be available in the computer laboratory. About one fourth of the students have worked through the assignments during these periods and they usually needed only a hint or two about how to proceed. Also, I have had the computer record usage and have refused to accept their assignments unless the computer has a record of their attendance at the computer laboratory. This seems to have cut the amount of copying assignments from what I have experienced with other assignments.

I have found that collecting and grading the assignments has encouraged students to do the assignments. I give a small amount of credit with a small range from high to low. I want to give enough credit to give an incentive to do the project, enough variation to encourage students to do it well, but not enough to make cheating worth while. I ~~avoid~~ cut the time-consuming task of grading all the papers by having a student secretary ~~do it~~ help.

Things that have worked well for me may not work well for other instructors. Also, other instructors may have other goals in using these simulations than those I had. You should be willing to experiment with new ways to use the simulations. If you find ways to use them that are better than those ways suggested in the Student Guide or in these Notes, use them and ignore my suggestions.

Here are a few miscellaneous notes about the investigations. In the second part of Investigation #1 the model is constructed so that the multiplier is NOT 1/(1-MPC). Most textbooks emphasize this formula, but it is a formula that holds in a very small class of income-expenditure models. It does not hold in the model represented by the second table because investment is here a function of income.

After students have turned in Investigation #2 I have flowcharted the sequence of decisions that they have used and suggested that this sequence would be useful in Investigation #3. Also, the target numbers in this assignment can be easily changed by the instructor in class so that students are encouraged to rely on their own efforts.

The question at the end of exercies #3 about the desirability of deficits is to emphasize that an implication of the model is that deficits are not necessarily bad. Politicians will worry about deficits if they or their constituents do not believe the model. In answering the question about what the model implies about the cause of the depression, there is a tendency for students to state that the government caused the depression by being too concerned with keeping the budget balanced. Unless it is specifically pointed out to them, many miss the point that investment dropped. A few cannot think in terms of this model even after working through these exercises (and being told repeatedly that models are not reality), and state that overspending by the government caused the Depression.

When running ECM2 students sometimes are confused by the original simulated result. The velocity they must work with can be different from the original simulated velocity. A line from the table given at the start of the simulation is given each year because it creates a parallel to ECK2 where

necessary information was in the line, because the student can keep better track of where he is, and because he should learn enough about the workings of the model to understand why the velocities may differ. (See the sample output in the Student Guide.)

Investigations 6 and 7 can be inverted - i.e., the student can be asked to use M-2 in investigation 6 and M-1 in 7. If numbers are changed for target GNP, care should be taken so that targets are not given that are impossible to reach. (If, for example, target GNP is 100 in 1929 and 99 in 1930, the 1930 target cannot be hit because a small decline in money is amplified by a sizeable drop in velocity.)

(Since the start of 1980 a new series of money-stock aggregates has been published by the Federal Reserve. See The Federal Reserve Bulletin, February 1980, pp. 97-114.)

The picture illustrating the multiplier process before the investigations is worth commenting on in class. I have tried to explain that the multiplier process means that a small change from outside the model -- an autonomous or exogeneous change - may be able to induce a larger change within the model - an endogeneous change. My students have been able to see this quite clearly in the case of the picture. Incidentally, this sort of stand-up sit-down model is shown graphically in Schelling's books. The graph is identical to the popular Keynesian cross.

A small book called Interactive Computer Graphics in Science Teaching edited by John McKenzie, et al. (Ellis Horwood Limited, 1978, distributed by Halsted Press, division of John Wiley) summarizes extensive experience in the U.K. with computer aided learning, and makes some suggestions that may be useful in using this package. They find that instructors often

modify the Student Guide but rarely the programs. The Student Guide illustrates the educational philosophy behind the teacher, but this should not be evident in the programs, which should be neutral. They find that letting two students work together on a terminal is effective. Another point made is that lectures should proceed computer work — computer-aided-learning material makes a poor introduction. Also, students will do work only if they think it important, and the easiest way to show this is to require written work. Packages can be used for classroom demonstration. And finally, one of the chapters points out that one advantage of CAI is that it can give students an intuitive understanding on which other understanding can be built.

The approach that I employ in my introductory course and which the simulations help make successful is to examine models, stressing that models or theories are not reality, but are necessary for us to understand reality. A schema of development by William Perry (from Forms of Intellectual and Moral Development in the College Years: A Scheme

is worth keeping in mind when using this approach. One can simplify Perry's scema to four stages of intellectual development: dualism, multiplicity, relativisim, and committment in relativism.

At the earliest stage of development, the student believes that there is one right answer for every question and that teacher is supposed to tell students what that right answer is. It is the view of education expressed by one of my students who told me to stop confusing him with my discussion of theory and to tell him the way things really are. Students at this level of development are concerned with memorizing, not analysing. If students cannot get beyond this stage, they will miss most of what these

simulations are trying to do.

The next stage is that of multiplicity. Here students believe that any opinion is as good as any other. If students have reached this stage, and the package may help them get here, they should get considerable benefit from the package.

However, I do hope that the package will help many students begin to move into the third stage, that of relativism. Here students begin to see that opinions can be judged and evaluated. To evaluate, one must begin to analyse and apply criteria of judgement. In the case of economic theory, they should begin to see that theories do not necessarily describe reality, and if they do not, they must be modified or rejected.

The final stage is one of committment, of choosing among alternatives. It is unrealistic to expect introductory students to reach this stage.

The Discussion Questions

Generally I use only a few discussion questions from texts for class discussion or as homework problems. However I like to have them included because I do look them over and sometimes incorporate ideas from them in my class presentations. I assume that many instructors using this package use discussion questions in a similar way.

Discussion questions are arranged so that students should be able to answer the first ones with what they learn from the simulations and the Student Guide, but will need to do further research to answer the some of the final questions. Some questions do not have answers that all economists would agree on — they are still matters of controversy.

Below are some suggested answers to the questions, plus occassional comments.

1.) Many activists explain the Great Depression with theories related to that in ECK2. A simple explanation of this viewpoint can be found in the book by Heilbroner listed in the Suggestions for Further Readings. The nonactivists generally use an explanation similar to that in ECM2 to explain the Depression. The government had the responsibility to maintain monetary stability, but policy mistakes lead to the reduction in money stock. The Friedman-Schwartz book elaborates on this view. (I have used this as a homework assignment — the students must answer it in a typed, one-page paper — with good results.)

2.) A variety of answers are possible.

3.) M-2 should be closer, but both will understate the change in GNP. Some economists want to define money stock empirically -- that variable which the Federal Reserve can control and which has the closeest association to total spending.

4.) Most economists think so. In the ISLM model, a widely used model in textbooks, it makes a difference. Funding by money creation is most expansionary, by taxing least.

5.) Short-run movements in M and V must be inversely related. A five percent rise in money would, for example, be accompanied by a five percent decline in velocity. A theoretical reason for expecting this is that a change in money stock changes interest rates, and interest rates are a determinant of velocity. Though this argument has lead to the claim that M and V are inversely related, especially by those attacking the Quantity Theory, the historical record from 1930 until the present quite clearly shows the M and V tend to be positively related.

The Quantity Theory argues that changes in government spending that are financed without money creation crowd out immediately private spending, so the multiplier process never gets started.

6.) GNP is an estimate of final output, and this is used as an indicator of the health of the economy. Because there are deficiencies with how well it measures our economic wellbeing, some economists have attempted to expand it to a measure of economic welfare, an exercise that had less than spectacular results. Many of our macroeconomic series have serious conceptual or measurement problems, a topic discussed at length in Oskar Mogenstern, On the Accuracy of Economic Observations (2nd ed., Princeton Univ. Press, 1963).

7.) The drop in money stock involved several factors in a complex sequence. A decline in member bank borrowing from the Federal Reserve was the major factor in the decline in money stock until late 1930. Then in October 1930 and March 1931 the first two banking crises occurred, and the rise in currency held by the public put downward pressure on the money stock. A large drop in gold in late 1931 caused by speculation the the U.S. would devalue the dollar contributed still further to the decline in money stock. The gold-currency flows plus a rise in excess reserves starting in 1932 more than offset sizeable open market purchases in the second and third quarters of 1932. The final major event in the contraction of money stock was the banking panic of February and March 1933. In 1937-38, the decline in money stock was caused by a doubling of reserve requirements. The thesis that changes in business activity caused much of the change in money is held by many non-monetarists. A monetarist can agree that changes in income do cause changes in money, though he will probably argue that this linkage is less important than the money-to-income change.

8.) Many explanations exist to explain the erratic movements in investment. It seems unreasonable to treat it all as exogeneous, though some may have been. One interesting attempt to explain investment is in Clarence L. Barber, "On the Origins of the Great Depression," Southern Economic Journal 44(3) (January 1978), pp. 432-56. In addition to supplying a good summary of views and a bibliography, Barber develops the thesis that changes in the rate of growth of population triggered the drop in investment that caused the Depression.

The reduced form for the model used in ECK2 is:

$$Y = 42 + 3(Inv) + 3(Gov) - 2(Tax).$$

If one uses the 22 years of 1929-50 (see question 12) in a regression, one obtains:

$$Y = \underset{}{33.9} + \underset{(.423)}{3.37(Inv)} + \underset{(.365)}{1.61(Gov)} + \underset{(.808)}{.08(Tax)}$$

$$\bar{R}^2 = .99 \qquad DW = 1.68$$

(The values in parentheses are the standard errors of the regression coefficients) Several things are striking in this equation. First, the Durban-Watson statistic is close enough to 2 so one can reject the hypothesis of first-order autocorrelation at the .05 level, which is unusual for simple time series. (In contrast, trying to obtain an estimate of the consumption function leads to serious problems with autocorrelation.) Second, the regression coefficient on investment is much larger than that on government spending. A simple explanation for this is that there is a feedback relationship: investment also depends on income. Finally, the regression coefficient of taxes is not significantly different from zero. The model leads one to expect a negative result.

Data used in this regression can be found in the simulation or in question 12.

22

More recently those who hold the"spending" hypothesis have downplayed the importance of investment. Temin suggests an autonomous drop in consumption and Paul Samuelson suggests a series of accidents. (One suspects that Temin and the monetarists are talking past one another. His book received hostile reviews from monetarists and converted none of them. In part this is because he uses static, equilibrium analysis to explain events which monetarists consider dynamic, disequilibrium events. The most clear case of this is his suggestion that since the real quanity of money was as large in 1931 as in 1929, money could not have caused the decline in real output. (See Temin, pp. 142, 170.) Monetarists are unlikely to accept this reasoning seriously; it seems too similar to arguments made during German hyperinflation of 1921-23 that the increase in money stock could not possibly have been the cause of the inflation because there had been a sizable fall in the real quantity of money. See Costantino Bresciani-Turroni, The Economics of Inflation: A Study of Currency Depreciation in Post-War Germany (Augustus Kelly, 1937), pp 44-5, 156-8.)

9.) Neither model as it is presented in the simulation explains the international scope of the Depression. The monetarist approach stresses that it was carried abroad by the workings of the international financial system. Friedman-Schwartz discuss this, as does Gottfried Haberler in The World Economy, Money, and the Great Depression, 1919-1939 (American Enterprise Institute for Public Policy Research, Washington, D.C., 1976). Haberler's book is very short and not technical, but the reader must be familiar with basic concepts of international financial theory. Charles Kindleberger, in the book listed in the Student Guide, also stresses the workings of the international economic system, though not the monetary side. He believes the instability of the system caused by British inability and American unwillingness to assume leadership allowed small shocks to topple the world economy. America was unwilling to maintain open markets (the Hawley-Smoot tariff), or to provide countercyclical long-term lending, or to be a lender of last resort.

10.) Certainly the Keynesian ~~prescription~~ prescription of massive government spending would have been considered fiscal irresponsibility. Both Hoover and Roosevelt ran on platforms promising a balanced budget. ECK2 has a comment when students run big deficits. The gold standard formed the principle constraint on monetary policy, though Friedman-Schwartz argue that it was more a potential than actual constraint. When the U.S.revalued gold in 1933, this constraint was lifted. (In addition to the Friedman-Schwartz and Chandler studies, Elmus Wicher's Federal Reserve Monetary Policy 1917-1933 (New York: Random House, 1966) discusses the motives behind policy.)

11.) The ISLM model was developed as such a model. Because it predicts real interest rates as well as income, the number of assumptions needed to get a good fit for the period is probably greater than those needed in ECK2 or ECM2. Also, it is not clear which interest rate — long or short, nominal or real — should be used.

12.) This question introduces the question of validation which should come up sometime in a course which contains two theories that differ so much. One criterion a theory must meet is that it be able to predict events other than those which were used in constructing it. In the table and on the semi-log graph below I show predicted GNPs for the decade after the period in the simulation for each of the three models used in the simulation.

None of the three does a really good job of predicting historical GNP. The two monetary projections miss the post-war slump. They do project a slowing of growth, but not a decline. The projection of the simple income-expenditure model sees a return of the Depression, a concern of many forecasters after the war. During the war the model overpredicts because there was a clear case of "crowding out" of consumption expenditures. The even more obvious crowding out of investment expenditures does not affect the model because the model does not in fact predict GNP -- it predicts consumption. It takes investment and government spending as given and as not needing explanation.

If real data instead of nominal data are used in ECK2, the predictions using ECK2 are a bit higher but still have the same shape. The last column of the table below shows this.

Most textbooks stress that velocity is not a constant, One can see substantial variation in the 1930s and in the 1940s. Most texts do not mention that the multiplier cannot be a constant either. That is very apparent in the table and graph given here. Variation

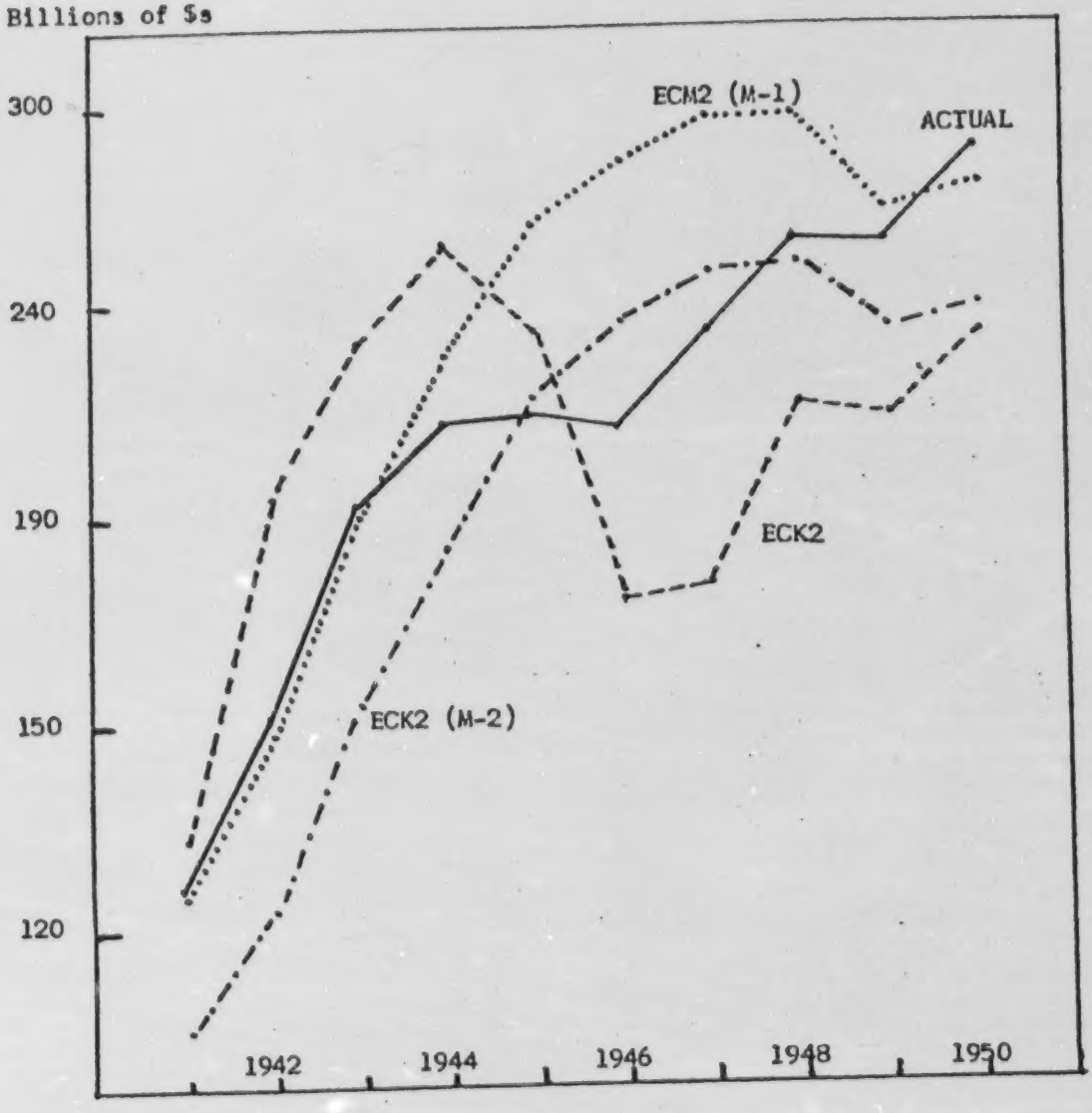
The comparison of simple models resulted in considerable controversy in the 1960s and early 1970s. A major conclusion from it was that no one could agree what should be counted as autonomous spending. For a summary of the debate, see William Poole and Elinda B.F. Kornblith, "The Friedman-Meiselman CMC Paper: New Evidence on an Old Controversy," American Economic Review, December 1973, pp. 908-17.

A final point that might be made in comparing these simulations is that not only is the empirical evidence confusing when one tries to choose the better theory, but the very different political implications add to the controversy. Simply put, the policy implications of the Keynesian model are distasteful to many conservatives but agreeable to many liberals. To believe that this sort of factor does not influence people's choices between models is to have a very idealist view of what is involved in intellectual controversy.

Year	Historical GNP	ECK 2	Predicted GNP ECM2(M-1)	ECM2 (M-2)	ECK2 using real data
1941	124.9	131.9	123.3	106.3	131.4
1942	158.3	194.6	146.7	121.0	200.2
1943	192.0	230.4	191.4	152.8	244.1
1944	210.5	258.5	226.2	181.6	276.1
1945	212.3	233.8	263.0	215.3	254.5
1946	209.6	173.6	282.1	235.8	194.8
1947	232.8	175.5	296.2	248.2	201.4
1948	259.1	214.4	297.6	251.8	240.4
1949	258.0	211.7	266.8	233.0	241.9
1950	286.2	231.6	273.9	238.3	262.2

Sources of data used in computing this table:

Historical Statistics of the United States, U.S. Bureau of the Census, Part 2, 1975, p. 922 and The National Income and Product Accounts of the United States, 1929-1974 (Department of Economic Analysis, U.S. Department of Commerce), pp. 2, 94, 324, 339. For last column, 6, 324, 344, 158, 349. For the last column the intercept of the consumption function was adjusted upward using the GNP deflator, and taxes were computed by subtracting from government spending the deficit or surplus after adjustment using the GNP deflator. The real GNP thus computed was then converted to current-dollar GNP using the GNP deflator.



GNP: ACTUAL AND PREDICTED, 1941 to 1950

I have kept the simulations in this package very simple by intention. In a survey of economic education, John Siegfried and Rendig Fels suggest that a reason that simulation seems not to have improved instruction in economics is that the temptation that the computer provides to do complex things may have eliminated its instructional usefulness ("Teaching College Economics: A Survey", Journal of Economic Literature, September 1979, p. 942). If this package does not succeed, it will not be because the models were too complex.

In addition to using this package to teach the mechanics of simple models, the teacher can use it as an introduction to more complex models such as ISLM. Some suggestions of how more complexity could be introduced are:

1. Lags in the consumption function could be added. Expected income should depend on past incomes. This change introduces an adjustment process and takes one away from static, equilibrium models.

2. Investment can be made to partly depend on income. (This is suggested in Investigation #1.) One way to do this in class is to ask students to look at the investment and income data in the first table of the sample run of ECK2, and to decide what marginal propensity to invest would be appropriate. The teacher can then discuss the need to have MPC + MPI less than one for stability, the effect on the multiplier, and the difficulty of defining exogenous expenditures, a difficulty the controversy sparked by the Friedman-Meiselman study highlighted.

   On this last difficulty, several of those holding the "spending" hypothesis of the Great Depression have taken positions that are not testable and thus are nonscienfific. Implicitly or explicitly they are saying that there is little to learn from the Depression because there is little that can be generalized. Peter Temin's reliance on the autonomous shift in the consumption function is such a position, and Samuelson's explanation of the period 1929 to 1933 in terms of accidental or fortuitous factors is explicitly such a position (Paul Samuelson, "Myths and Realities about the Crash and Depression," Journal of Portfolio Management, Fall 1979, pp. 7-10.)

3. The new supply-side economics as well as the trdditional Keynesian view of the full-employment budget tell us (for different reasons) that the proper tax variable as far as the policymaker is conerned is tax rate not tax revenue. Tax revenues may change withoug any change in tax rates because income changes, and a 1% change in tax rates can have less than a 1% change in revenues if people's behavior changes. Making this change in the model would be complicated.

4. Advanced or very bright students could be given data for a more recent period, say 1965 to 1975, and asked to build models similar to those in ECK2 and ECM2. They could then explore how different or similar these models whould be to the ones in this package.

ECK1 and ECM1

These two programs are included in the package for two reasons. First, they can provide practice to students who have never used the computer before. The student is less likely to get frustrated in dealing with the machine if the material is in a conventional CAI format. And second, students can use these programs as pretests to see if they are ready to advance on to the simulations. The Student Guide in fact makes the questions contained in them into pretests, and these programs allow students to get help if they have difficulties with the pretests.

Though these two lessons are less important than the simulations, I believe that they add much to the package and that students should be encouraged to use them prior to using the simulations.

```
ECN1

THIS LESSON IS INTENDED TO HELP YOU UNDERSTAND THE EQUATION OF EXCHANGE
AND A THEORY OF INFLATION AND UNEMPLOYMENT WHICH IS BASED ON THIS
EQUATION CALLED THE QUANTITY THEORY OF MONEY.

IF YOU WANT TO REPEAT A SECTION OR SKIP SECTIONS, YOU CAN SHIFT TO
WHICHEVER OF THE 7 SECTIONS YOU WANT BY TYPING IN /BACK WHEN I ASK FOR
A RESPONSE.  TO STOP AT ANY POINT, TYPE IN /STOP.  IF YOU HAVE NO IDEA
OF WHAT THE CORRECT ANSWER IS, GUESS AND THE COMPUTER WILL EXPLAIN WHY
YOUR ANSWER IS WRONG.
TYPE GO ON AND HIT RETURN WHEN YOU ARE READY TO CONTINUE.
go

B1
THE EQUATION OF EXCHANGE IS AN IDENTITY, THAT IS, A STATEMENT TRUE
BY DEFINITION.  IT SAYS THAT THE AMOUNT OF MONEY IN CIRCULATION
MULTIPLIED BY THE AVERAGE NUMBER OF TIMES A DOLLAR IS SPENT FOR FINAL
OUTPUT EQUALS GNP.  THUS IF AN ECONOMY HAS A MONEY SUPPLY OF 100 AND
AND EACH UNIT OF MONEY IS SPENT AN AVERAGE OF FIVE TIMES A YEAR, GNP
WILL BE 500.

IF THE MONEY SUPPLY IS 200 AND EACH UNIT OF MONEY IS SPENT AN AVERAGE
OF EIGHT TIMES A YEAR, HOW LARGE WILL GNP BE?  (ENTER A NUMBER.)
ten

YOUR ANSWER IS NOT A NUMBER.  PLEASE TRY AGAIN.
10

INCORRECT.  200 MULTIPLIED BY 8 EQUALS 1600.

B2
PUTTING THIS IDEA INTO EQUATION FORM GIVES US THE EQUATION OF EXCHANGE:
     MV = Y
WHERE M IS THE MONEY STOCK, V IS THE VELOCITY OF MONEY OR THE AVERAGE
NUMBER OF TIMES A DOLLAR CIRCULATES, AND Y IS GNP.  SOMETIMES THIS
EQUATION IS WRITTEN IN A DIFFERENT FORM:
     M = (1/V)Y      OR      M = KY.
K CAN BE INTERPRETED AS THE FRACTION OF INCOME KEPT IN AVERAGE CASH
BALANCES.

IF GNP IS 100 AND V IS 5, WHAT MUST M BE?
500

INCORRECT.  THE CORRECT ANSWER WAS 20.  THE EQUATION ABOVE STATED
THAT M = (1/V)Y, SO SUBSTITUTING IN THE NUMBERS GIVEN WE GET
M = (1/5)100 = 20.

B3
FROM 1946 TO 1972, U.S. GNP ROSE FROM $211 BILLION TO $1130 BILLION
AND THE MONEY STOCK ROSE FROM $106 BILLION TO $246 BILLION.  WHAT CAN
WE SAY ABOUT THE VELOCITY OF CIRCULATION?
A. IT FELL.
B. IT ROSE.
C. IT REMAINED CONSTANT.
D. WE CANNOT SAY ANYTHING CERTAIN ABOUT VELOCITY BASED ON THIS
   INFORMATION.
d
```

OF EXCHANGE, DO TELL US WHETHER PEOPLE WERE SPENDING MONEY FASTER IN 1945 OR IN 1972. TRY AGAIN.

./back

WHICH SECTION DO YOU WANT TO TAKE?

10

THAT IS NOT A LEGAL SECTION. TRY A NUMBER BETWEEN 1 AND 7.
WHICH SECTION DO YOU WANT TO TAKE?

6

#6
THE DATA IN THE LAST QUESTION (THAT TRANSACTION VELOCITY WAS 30 AND GNP VELOCITY WAS 4) ALSO INDICATE THAT:
A. ONLY ABOUT ONE TRANSACTION IN SEVEN OR EIGHT WAS A TRANSACTION TO BUY FINAL OUTPUT.
B. GNP WAS 30 TIMES AS LARGE AS THE MONEY STOCK.
C. M-2 WAS 7 1/2 TIMES LARGER THAN M-1.
D. THE PRICE INDEX WAS RISING AT A 7 1/2% RATE.

C

INCORRECT. THERE IS NO INFORMATION ABOUT M-2 VELOCITY GIVEN ABOVE. TRY AGAIN.

D

INCORRECT. THERE IS NO INFORMATION ABOUT THE PRICE INDEX GIVEN IN THIS QUESTION. TRY AGAIN.

A

CORRECT.

#7 LAST SECTION
THE EQUATION OF EXCHANGE BECAME IMPORTANT WHEN PEOPLE SAW A RELATIONSHIP BETWEEN THE QUANTITY OF MONEY AND BUSINESS ACTIVITY. SOME OF THESE PEOPLE ARGUED THAT CHANGES IN MONEY CAUSED CHANGES IN BUSINESS. THEY SAID THAT V WAS FAIRLY STABLE AND THAT CAUSATION RAN FROM M TO Y. PUTTING THESE RESTRICTIONS ON THE EQUATION OF EXCHANGE GIVES US WHAT IS CALLED THE QUANTITY THEORY OF MONEY.

FROM 1929 TO 1933, GNP IN THE U. S. DROPPED FROM $104 BILLION TO $58 BILLION. WHAT EXPLANATION WOULD THE QUANTITY THEORY SUGGEST FOR THIS DECLINE?
A. THE WRONG AMOUNT OF GOVERNMENT SPENDING.
B. INSTABILITY OF V.
C. THE STOCK MARKET CRASH OF 1929.
D. A REDUCTION IN THE MONEY STOCK.
E. INSTABILITY OF THE MARKET SYSTEM.

A

INCORRECT. THE QUANTITY THEORY IMPLIES THAT CHANGES IN GOVERNMENT SPENDING ARE NOT AN IMPORTANT FACTOR IN DETERMINING SHORT-RUN CHANGES TRY AGAIN.

C

INCORRECT. THE QUANTITY THEORY DOES NOT INCLUDE THE STOCK MARKET AS AN IMPORTANT VARIABLE. TRY AGAIN.

D

CORRECT. IN FACT THE MONEY STOCK DID DECREASE BY ABOUT 25% DURING THESE YEARS, AND MONETARISTS ARGUE THAT THIS WAS THE CAUSE OF THE GREAT DEPRESSION. SOME NONMONETARISTS, HOWEVER, ARGUE THAT THIS DECLINE IN MONEY WAS CAUSED BY, RATHER THAN CAUSED, THE DROP IN GNP.

ECK1

THIS LESSON EXAMINES THE WORKINGS OF A VERY SIMPLE KEYNESIAN MODEL. BEFORE YOU BEGIN THIS LESSON YOU SHOULD HAVE SOME FAMILIARITY WITH NOTIONS SUCH AS THE MULTIPLIER, THE MARGINAL PROPENSITY TO SAVE AND CONSUME, AND KEYNESIAN EQUILIBRIUM.

IF YOU WANT TO REPEAT A SECTION OR SKIP SECTIONS, YOU CAN SHIFT TO WHICHEVER OF THE 14 SECTIONS YOU WANT BY TYPING IN /BACK WHEN I ASK FOR A RESPONSE. TO STOP AT ANY POINT, TYPE IN /STOP. IF YOU HAVE NO IDEA OF WHAT THE CORRECT ANSWER IS, GUESS AND THE COMPUTER WILL EXPLAIN WHY YOUR ANSWER IS WRONG.

ARE YOU READY TO BEGIN? (TYPE YES WHEN YOU ARE READY AND HIT RETURN)

[Y]

P1

SUPPOSE WE HAVE AN ECONOMY THAT RUNS ACCORDING TO THIS KEYNESIAN MODEL:

IF INCOME IS:	PEOPLE WILL:			BUSINESS	GOVERNMENT
	CONSUME	SAVE	PAY AS TAXES	INTENDS TO INVEST	WILL SPEND
160	150	10	0	30	0
200	180	20	0	30	0
240	210	30	0	30	0
280	240	40	0	30	0

WHAT IS THE EQUILIBRIUM LEVEL OF INCOME?

[160]

INCORRECT. TO BE IN EQUILIBRIUM, THE AMOUNTS THAT PEOPLE WANT TO CONSUME, BUSINESS WANTS TO INVEST, AND THE GOVERNMENT WANTS TO SPEND MUST EQUAL INCOME. ANOTHER WAY OF LOOKING AT THIS IS BY FINDING THE LEVEL OF INCOME AT WHICH LEAKAGES FROM THE FLOW OF SPENDING -- SAVINGS AND TAXES -- EQUAL INJECTIONS INTO THE FLOW OF SPENDING -- INVESTMENT AND GOVERNMENT SPENDING. TRY AGAIN.
WHAT IS THE EQUILIBRIUM LEVEL OF INCOME?

[help]

I DO NOT UNDERSTAND YOUR ANSWER. DO YOU NEED HELP?

[y]

IF YOU NEED TO HAVE A TABLE REPEATED, TYPE IN /HELP WHEN I ASK FOR A NUMBER. IF YOU WANT TO REPEAT A SECTION, TYPE IN /BACK. TO STOP, TYPE IN /STOP. OTHERWISE, PLEASE ENTER AN ANSWER THAN IS A NUMBER.

[150]

THE CORRECT ANSWER WAS 240.

#2
WHAT IS THE MARGINAL PROPENSITY TO INVEST IN THE ABOVE TABLE?

/help

IF INCOME IS:	PEOPLE WILL: CONSUME	SAVE	PAY AS TAXES	BUSINESS INTENDS TO INVEST	GOVERNMENT WILL SPEND
160	150	10	0	30	0
200	180	20	0	30	0
240	210	30	0	30	0
280	240	40	0	30	0

WHAT IS THE MARGINAL PROPENSITY TO INVEST IN THE ABOVE TABLE?

0

CORRECT.

#3
YOU WILL NEED THE TABLE FREQUENTLY THROUGHOUT THIS EXERCISE. TO SEE IT AGAIN, TYPE IN /HELP WHEN I ASK A QUESTION.

WHAT IS THE MARGINAL PROPENSITY TO SAVE IN THE ABOVE TABLE?

/back

WHICH SECTION DO YOU WANT TO TAKE?

11

#11
WHAT IS THE MARGINAL PROPENSITY TO INVEST IN THE ABOVE TABLE?

-/HELP

IF INCOME IS:	PEOPLE WILL: CONSUME	SAVE	PAY AS TAXES	BUSINESS INTENDS TO INVEST	GOVERNMENT WILL SPEND
190	162	18	10	8	20
250	207	27	16	20	20
310	252	36	22	32	20
370	297	45	28	44	20
430	342	54	34	56	20

WHAT IS THE MARGINAL PROPENSITY TO INVEST IN THE ABOVE TABLE?

.20

CORRECT.

#12
WHAT IS THE MARGINAL PROPENSITY TO SAVE IN THE ABOVE TABLE?

/stop

INSTRUCTIONS FOR USING THE COMPUTER – SAMPLE HANDOUT

The Terminals

The terminals at which you will take the lessons resemble television sets with the keyboard from a typewriter. When you type on the keyboard, the results are displayed on the screen. Likewise, the computer can talk to you by writing on the screen. Since you can talk to the computer and the computer can respond, and visa versa, this mode of computer use is called "interactive" computing.

The terminals operate very much like typewriters, but have some special features.

(1) There are two sets of number keys. Either set or both sets may be used. Note that zero and the letter O are not the same, nor can the letter L be used for the number 1.

(2) The computer does not know what you have written until you hit the RETURN key. When you hit the RETURN key, whatever you have written is sent to the computer.

(3) There are two ways to correct typing mistakes before you send your message to the computer. The first is to use the DEL (delete) key. Pressing this key results in a dash on the screen, but what you see and what the computer will see are not the same. Each dash from pressing the DEL key means one letter has been wiped out. You may press the DEL key as many times as necessary to delete your mistake.

The second method to correct a typing mistake is to cancel the whole line you have written. You can do this by pressing the Control (CTRL) button and simultaneously pressing X.

Many students initially try to correct mistakes by backspacing over them and retyping. Again, what you see on the terminal and what is sent to the computer is not the same. The letters you wanted to delete are still there as far as the computer is concerned, only they are now followed by backspaces. Since none of the answers that the computer will be looking for have backspaces in them, the computer will not understand your answer and will tell you that you are wrong.

(4) The HOME, CLEAR, and RESET keys are not needed by you so do not use them. Students have been observed hitting the clear button to stop a program. This clears the screen, but the computer is still running the same program. Again in this case, what you see and what the computer sees are not the same.

Signing onto the system and getting your program

By signing onto the system, we mean that you want to tell the computer that there is someone at a particular terminal who want to use the programs stored under a certain account number. You will be given an account number by your instructor.

a. To sign on, you want to say HELLO to your accound number. Suppose your account number is A303. Then you will type: HELLO-A303, or HEL-A303, (do not forget to type a comma after A303) and then, as we described before, enter this into the computer by pushing RETURN. (The computer may respond with three question marks ???. If so, simply repeat the above procedure.)

b. You must now tell the computer which program you want to use. You do this by typing in the word GET with the name of the program, or;

   GET - ECK1

   You then enter this by pressing Return.

c. You have now told the computer that you wish to run the ECK1 program on your terminal. To start this program type in:

   RUN and press RETURN

Signing off

When you complete a program, the computer responds with the word:

DONE

If you wish to rerun the program, simply type in

RUN and push RETURN.

If you wish to leave the terminal, type in:

BYE and press RETURN.

TWO SIMPLE MACROECONOMIC SIMULATIONS AND THE GREAT DEPRESSION

a student guide

Robert E. Schenk
St. Joseph's College
Rensselaer, IN 47978

Copyright ©1980 by Robert Schenk

This material was based on work partially supported by the National Science Foundation under Grant No. SER78-00065. Any opinions, findings, and conclusions or recommendations expressed herein are those of the author and do not necessarily reflect the views of The National Science Foundation.

CONTENTS

INTRODUCTION

A. What Does This Guide Do?

B. What Are Models?

C. Why Use These Simulations?

D. Why Study About The Great Depression?

THE INCOME-EXPENDITURE SIMULATION ECK2

A. Background

B. Investigations

C. Sample Output

THE QUANTITY THEORY SIMULATION ECM2

A. Background

B. Investigations

C. Sample Output

MULTIPLE-CHOICE REVIEW QUESTIONS

DISCUSSION QUESTIONS AND SUGGESTIONS FOR FURTHER STUDY

INTRODUCTION

"Experience in controversies such as these brings out the impossibility of learning anything from facts till they are examined and interpreted by reason; and teaches that the most reckless and treacherous of all theorists is he who professes to let facts and figures speak for themselves...."

Alfred Marshall

A. What Does This Guide Do?

This Guide describes two computer simulations of the Great Depression. It gives you a brief review of the theories embedded in the simulations, some assignments to help you explore the theories using the simulations, and output from sample runs.

A simulation requires you to apply ideas. Applying ideas involves a higher level of learning than memorizing definitions. Therefore computer simulation is more difficult than other forms of computer-assisted instruction. The purpose of the exercises (or investigations) in this Guide is to make your meetings with the simulations less difficult for you. The Guide, with the aid of two programs called ECK1 and ECM1, will first help you review basic concepts that you need to understand the simulations. Then the Guide tells you what you should have done before you begin each exercise and what you should learn from the exercise.

You may be wondering what a computer simulation is. In a simulation the computer creates an environment -- a mini world -- which you are allowed to explore by making decisions. The environment that the computer creates is based on a model that I have given the computer. That model contains the rules of the environment. The computer is, in a sense, a referee which enforces these rules. When you make a decision, it tells you what outcome results from the logic of the rules. This explanation may not make a lot of sense to you if you have never before seen a computer simulation. It will make sense once you use the simulations described in this Guide.

B. What Are Models?

I have just told you that a computer simulation contains a model. But do you know what a model is?

A model is a picture of how things fit together. It is a way of summarizing information about how things are related. A model is similar to a map. A map also gives a picture of how things are related. Further, just as maps serve special purposes -- a road map is useful for different purposes than a geological map -- so models have limits to their usefulness, being able to explain only certain sets of facts. There is also the possibility that a model may be a bad model, just as a map may be a bad map. A bad map or model is one that misleads, that does not correspond well to the real world that it is trying to summarize.

You may not be aware of it, but you use models all the time because some sort of model is necessary to interpret events. One of the purposes of economics courses is to enlarge your collection of models so that you will be better able to interpret events. Other purposes are to make you more aware of how people use models and to point out some limitations of commonly used models. Most of you will someday work in business or government where you will find your working environment shaped in many ways by economic forces and economic models. If you learn to understand economic models, you will be better able to cope with that environment.

One important model that economists use is the model of supply and demand. In its simplest form it has three parts: a statement how buyers act (they buy more as price gets lower), a statement how sellers act (they sell more as price gets higher), and a condition for equilibrium (equilibrium exists when quantity supplied equals quantity demanded). In this form the model is entirely static meaning that it contains no information about how we get to equilibrium from disequilibrium.

Economists consider supply and demand an important model because it makes numerous predictions. It tells what to expect if a government imposes price ceilings below market prices. It tell us what to expect if the costs of production increase, or if there is an unexpected reduction in supply. It tells us what to expect about the price of a good if prices of goods that people use as substitutes change. Though all these expectations become commonsense to someone who thinks in terms of the supply and demand model, they are not always obvious to those who do not understand the model.

The two models discussed in this Guide are in some ways like and in other ways unlike the supply and demand model. They are like the supply and demand model because they contain statements about how people act, and because they make predictions about what to expect under certain conditions. They are also like the simple supply and demand model described above because in their simple forms they do not contain a description of how one gets from disequilibrium to equilibrium. They are unlike the supply and demand model because there is a great deal of disagreement among economists as to just how important these models are.

The two models presented in this Guide are intended to explore an important question of macroeconomics: what determines the amount of total spending in an economy. They will give you two different answers to this question. On the other hand, they do not give you any answer at all to a second important question of macroeconomics: how does this total amount of spending, or change in that spending, determine price changes and unemployment. Both simulations do compute rates of price change and unemployment, but more for entertainment value than anything else.

C. Why Use Computer Simulation?

Some subjects are learned completely only after working through problems. One could perhaps learn mathematics or computer programming by listening to lectures and reading without working through problems, but I have never met anyone who has. One does not fully understand the material in these fields unless one can apply it, and problems provide practice in application. Some aspects of economics also are best learned with problem-solving exercises. The attraction of the computer as an instructional tool is that it can help present a more educational and effective series of problems than can be presented in traditional forms. There are at least three ways the computer can increase the effectiveness of problems in macroeconomics.

First, by relieving you of the drudgery of complex calculation, the computer can open up to you more interesting problems than you could do otherwise. Because you need not worry about complex calculation, you can concentrate on the economic ideas involved. This ability to relieve students from complex calculation is a major reason students often find computer simulation a more enjoyable, less "dry" way of learning course material.

Second, computer simulation can help you see what abstract theory means when it is applied to real events. When theory is illustrated in terms of real events, you become more aware of the assumptions and limitations of the simple models your textbook discusses. If you are to use ideas properly, you should know what limitations they have. Also, as you work through the simulations with this Guide, you should become more aware that theories are not reality. Theories are interpretations of reality, and not all theories are good interpretations. A major concern of economists is to discover which theories are good interpretations of reality and which are poor. This process of judging theories has been very complex and difficult in macroeconomics, and by the time you finish the problems in the Guide you should begin to see why.

Finally, use of computer simulation makes possible problems in which you must generate a proper set of numbers, not simply process numbers that your teacher has previously given you. This sort of problem is a more complete problem, one that requires you to show that you understand the theory involved in the simulation so well that you can manipulate the environment that the computer gives you to get an appropriate set of numbers.

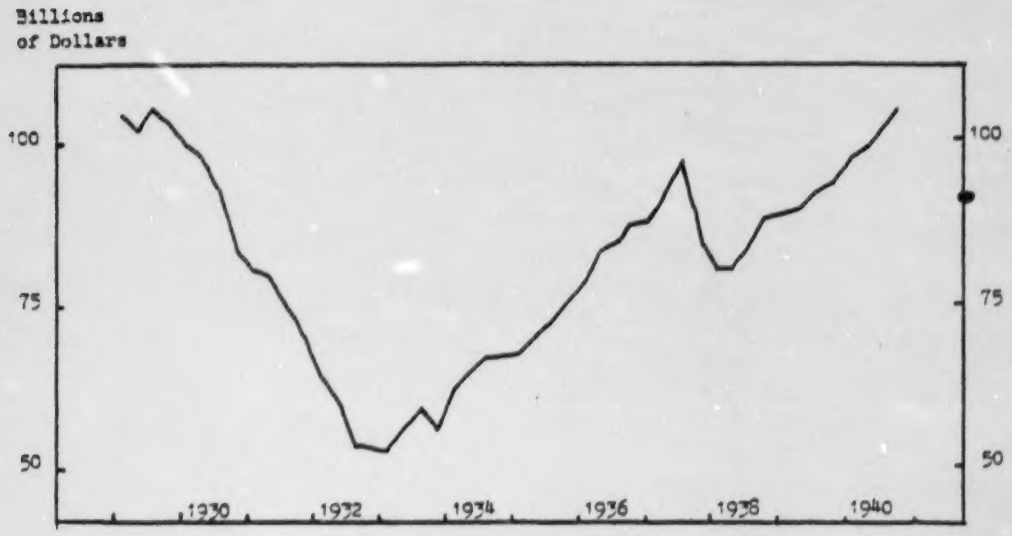
D. Why Study About The Great Depression?

The two simulations described in this Guide examine the years from 1929 to 1940, years you may consider ancient history. However many of today's events and attitudes have roots in this period. Thus you must study it if you want to understand the world today. For example, have you ever wondered why the Republican Party has been the minority party ever since you can remember, with the Democratic Party dominating Congress and the state legislatures? Are you aware that the Republican Party was the dominant political party from the 1870s until the 1930s? Without some knowledge of the Great Depression you cannot understand even this basic aspect of American politics.

There are two other, more important reasons that the Depression interests economists. First, the Depression presented a major problem for economists of the 1930s because they were totally unprepared for the tremendous decline in economic activity that occurred. Their attempts to explain these events have split economics into its present micro-macro division and have profoundly changed the material that appears in your introductory textbook. As a student, you may find it interesting to see not only the answers economists arrived at, but also the problem that led to these answers.

In addition, the period remains a test period. If we want to know what will happen in the future, it is desirable to have a theory that can tell us about the past. If a macroeconomic theory cannot explain the large fluctuations in economic activity in the 1930s, there is no reason to believe that it will be able to explain what will happen in the future when we hope economic fluctuations will be much smaller.

Let's look at those large fluctuations. The period that we call the Great Depression contains two separate recessions. (A recession is defined as a period when economic activity is falling or receding, not a period in which it is low. A period in which economic activity is low but increasing is called a recovery.) The first period of receding economic activity lasted from August of 1929 to March of 1933 and the second period lasted from May of 1937 to June of 1938. These declines can be seen in the sample output given later in this Guide. They are also very evident in the picture below where I have graphed an estimate of quarterly Gross National Product (GNP) from 1929 through 1940.



Quarterly GNP: 1929 to 1940

Source: Business Cycles Indicators, Vol II, Geoffrey H. Moore, Ed. (Princeton, 1961), p. 133.

The Great Depression also shows itself in other economic measurements. In the second picture below I have graphed unemployment statistics. The higher line in the picture is the official series which counted among the unemployed those working in government relief projects such as the Work Projects Administration (WPA). The lower line is an adjusted series which counted people working in government relief projects as employed. Both series show that between 20% and 25% of the American labor force was out of work at the bottom of the Depression. This is an extremely high figure when one realizes that there were few programs to help the unemployed at that time.

Source: Michael R. Darby, "Three-and-a-half Employees Have Been Mislaid, Or an Explanation of Unemployment, 1934-1941," Journal of Political Economy, February, 1976, p. 8.

A final picture shows what happened to prices during the Depression. Note that prices fell until 1933, dropping by more than 20%. They then rose between 1933 and 1934 even though there were large amounts of unemployed resources. Many people at that time were not alarmed by this "stagflation"; rather they thought that an increase in prices was desirable. In fact several government programs came into existence with a goal of increasing prices.

Source: Historical Statistics of the United States, part 1, U.S. Bureau of the Census, 1975, p. 197.

Even though this Guide and the computer simulations will give you some insight into the dispute about the causes of the Great Depression (especially if you work through the discussion questions and some of the suggestions for further reading at the end of this Guide), giving you this insight is not the major goal of this material. There are two other goals that are more important. First, this material should help you learn the mechanics of two traditional textbook models. And second, the material is meant to raise questions about how much each of these simple models actually does tell us about the world around us. In other words, we are more interested in what the Depression tells us about these two models than in what they tell us about the Depression.

THE INCOME-EXPENDITURE SIMULATION ECK2

> "With respect to the level of total purchasing power and employment, Keynes denies that there is an invisible hand channeling the self-centered action of each individual to the social optimum. This is the sum and substance of his heresy.... Left to themselves during depression, people will try to save and only end up lowering society's level of capital formation and saving...."*
>
> Paul Samuelson

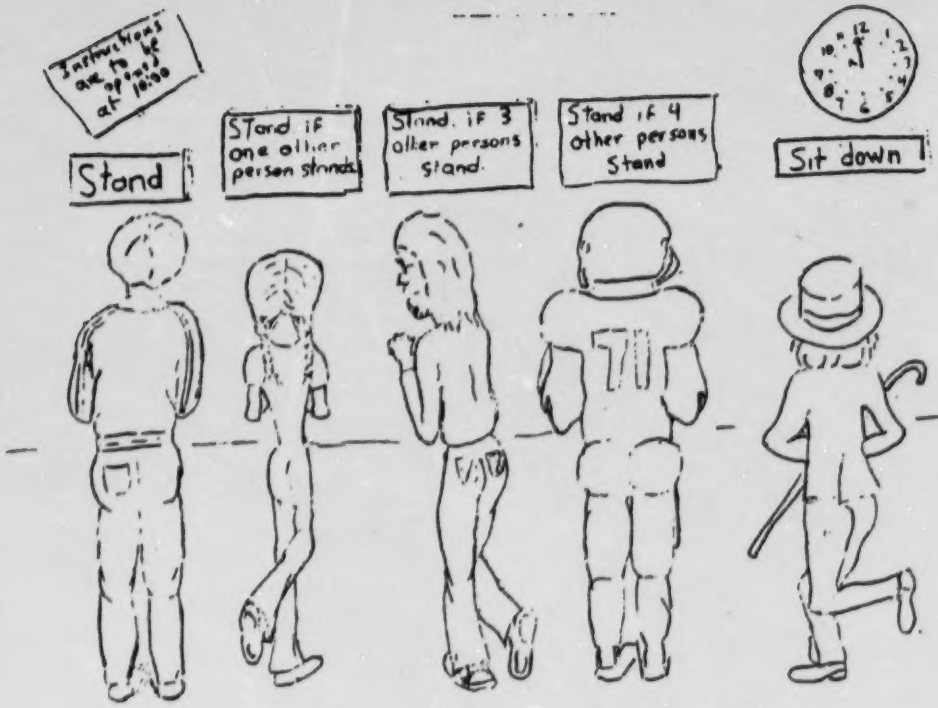
A. Background

The two simulations described in this guide provide alternative and contradictory views about the same events, the movements in GNP during the years 1929 to 1940. The fact that you are asked to consider two alternative interpretations of the same events may seem unusual. However there has never been total agreement among economists about what causes inflation and recession.

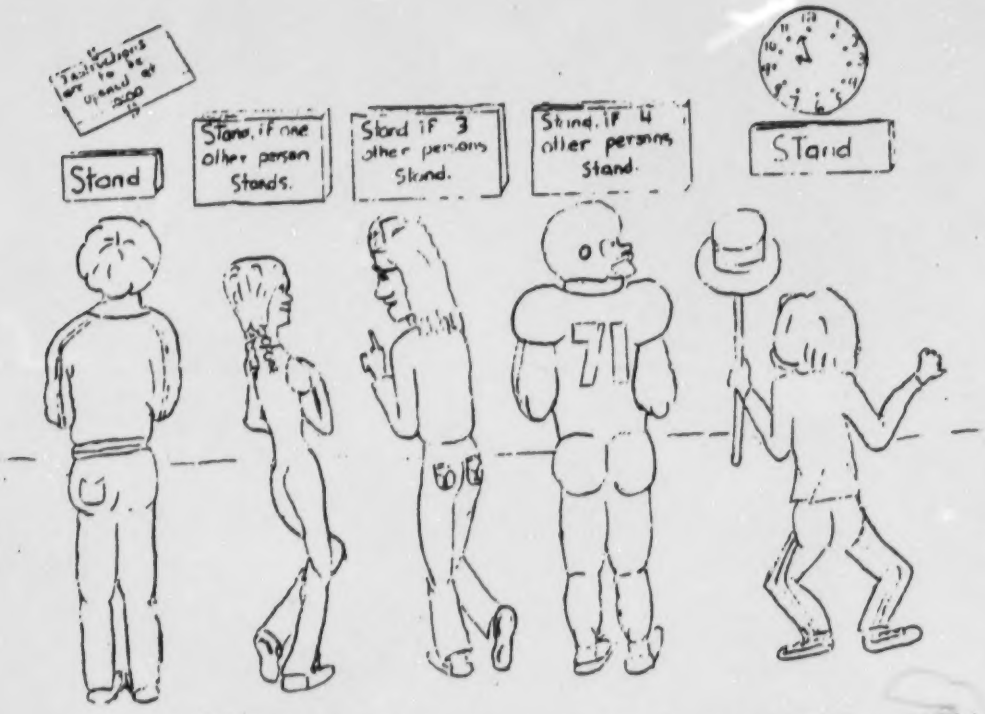
Prior to 1930 most economists thought these problems of inflation and recession were temporary stages of a periodic business cycle. Many also thought that this periodic cycle was related to variations in the money stock. Then in 1936 John Maynard Keynes published The General Theory of Employment, Interest and Money. This book sharply challenged many existing views. In it Keynes argued that it was possible for high levels of unemployment to persist for long periods of time, and that changes in money stock could be ineffective in remedying the problem. He suggested that the most effective solution would be an increase in government spending. Keynes' book was a quick success and ranks as one of the most influential economics books of all time.

After 1936 other economists tried to summarize the insights of Keynes' book in graphs and algebraic equations. The results of these efforts led to development of income-expenditure models (generally called Keynesian models) that have dominated discussion of macroeconomics since the 1940s. Though the income-expenditure model that the simulation ECK2 uses is a very simple model, it is a model that many economists believe captures some important aspects of how the world works. However most economists today believe that it also leaves out some important aspects of how the world works -- it is a special case of what is called the ISLM model, a model widely used as a framework for discussing macroeconomic theory and issues. Therefore few economists would consider models as simple as the one in the simulation more than rough approximations of how the world works. This was not always the case; in the 1940s, 1950s, and even the 1960s quite a few economists seemed to think that this sort of simple model was a fairly good approximation of reality.

*From "Lord Keynes and the General Theory," Econometrica, July 1946.


Instructions are to be opened at 10:00
Stand
Stand if one other person stands
Stand if 3 other persons stand
Stand if 4 other persons stand
Sit down

How many people will be left standing after 10:00?


Instructions to be opened at 10:00
Stand
Stand if one other person stands.
Stand if 3 other persons stand.
Stand if 4 other persons stand.
Stand

How many people will be left standing after 10:00? You should see the multiplier concept at work here. Explain how it works in this case.

The income-expenditure model attempts to explain total spending by dividing the total into several parts: into consumer spending, business spending, and government spending. It then asks what determines the size of each part. If one understands the parts, then one can combine them into a meaningful whole. This approach leads to very large and complex models because there are so many forces which influence spending decisions of consumers and businesses. The large forecasting models used by the government and large economic consulting firms show just how complex such models can become. These models contain hundreds of equations and variables.

The most basic income-expenditure or Keynesian model has only two components. First, the amount that people want to spend depends largely on their expected income. This statement incorporates an assumption about how people act. And second, spending will be in equilibrium when expectations are realized, that is, when spending equals expectedincome. Note that spending must always equal actual income because by definition one person's spending is another's income. Equilibrium exists only when the income people expect is what they actually get.

To make the income-expenditure model easier to contrast to the Quantity Theory model, the simulation predicts nominal (or current-price) GNP instead of real (or constant-price) GNP. Most explanations of the income-expenditure approach are in terms of real variables. Price movements are small enough for the period 1929 to 1940 so that it makes little difference whether the model uses real or nominal data. The model fits either about as well.

The simulation oversimplifies the modern Keynesian position. It does so because simple models are much easier for the beginner to understand than complex models. The model used in ECK2 has the advantages of being relatively simple to understand, of fitting the data quite well, and of being similar or identical to the income-expenditure model stressed in almost all introductory textbooks.

Almost all introductory textbooks contain excellent expositions of this model. They describe the logic of the model in tables, graphs, equations, and pictures of bathtubs, leaky buckets, and dollars racing around a circular-flow diagram. The structure of the model also reappears in models that may initially appear quite different, models called critical-mass models. Because this way of presenting the model's logic is not common in textbooks, I have illustrated it below. You should be able to see a multiplier process in these in these pictures. For further details about critical-mass models, see Thomas Schelling, Micromotives and Macrobehavior (New York: W. W. Norton & Company, 1978), chapter 3.

B1) Investigation #1 — A Review of Concepts

Objectives: This investigation is a self-test to see if you understand basic components of the Keynesian model. These components include the marginal propensities to consume and save, equilibrium income, fiscal policy, and the multiplier. When you are finished, you should be able to compute the multiplier if you know the change in government spending and the change in GNP.

Prerequisites: You should have read the explanation of the Keynesian model in your textbook. If you need further help on this exercise, use the computer program ECK1. This program will guide you to the correct answer by telling you why wrong answers are wrong.

****

1) Suppose the economy runs according to this Keynesian model:

If income is:	People Will: Consume	Save	Pay as Taxes	Business Intends To Invest	Government Will Spend
160	150	10	0	30	0
200	180	20	0	30	0
240	210	30	0	30	0
280	240	40	0	30	0

(a) The equilibrium level of income is _____.

(b) The marginal propensity to invest is _____.

(c) The marginal propensity to save is _____.

(d) When income is 240, the average propensity to consume is _____.

(e) For income to increase by 40, government spending must increase by _____.

(f) The multiplier is _____.

2) Complete the table below. Then answer questions (a) through (f).

If Income Is	People Will: Consume	Save	Pay as Taxes	Business Intends To Invest	Government Will Spend:
190	162	18	10	8	20
250	207	27	--	20	20
310	—	36	22	32	20
370	297	--	28	44	20
430	342	54	34	56	20

(a) The equilibrium level of income is _____.

(b) The marginal propensity to invest is _____.

(c) The marginal propensity to save is _____.

(d) When income is 250, the average propensity to consume is _____.

(e) For income to increase by 60, government spending must increase by _____.

(f) The multiplier is _____.

(Optional) Can you find the sets of equations from which I constructed these tables?

B2) Investigation #2 — Hitting a Target Using the Multiplier Principle

Objective: After you complete this investigation, you will be able to control GNP in a simple Keynesian model by controlling government expenditures.

Prerequisites: You should have completed investigation #1. Also, before you start, you should take a careful look at the sample output given at the end of this section.

****

Run simulation ECK2, making changes in the government spending needed to get simulated GNP equal to (or close to) target GNP. You should leave taxes at their historical levels, altering only government spending. When you are finished completing the table on the next page (note that I have started columns three and four; you must complete them) write a short explanation below of your strategy for choosing levels of government spending.

You may have to run this simulation more than once to achieve satisfactory results. Note also that you must figure out what the multiplier is very quickly if you want to complete this assignment. You should be able to do this if you use 9.8 for government spending in 1929 and compare your simulated results to the original simulated results.

Use of a hand calculator may help complete this exercise.
If you complete the assignment properly, the computer will print many rude comments and will finish by telling you that you do not know what you are doing. It does this because it assumes that you want to stop the Depression. Since that is not your assignment here, you should ignore all comments.

YEAR	TARGET GNP	ORIGINAL SIMULATED GNP	GAP	ADD GOV SPENDING NEEDED TO REACH TARGET GNP	TOTAL GOV. SPENDING	YOUR SIMULATED GNP
1929	—	100.7	—	+1	9.8	

When you increased government spending by 1 (from 8.8 to 9.8), GNP increased by _____. Therefore the multiplier is _____.

1930	100.7	82.7	18.0
1931	102	75.6	26.4
1932	103	58.1	
1933	120	58.4	
1934	120		
1935	120		
1936	120		
1937	120		
1938	120		
1939	120		
1940	120		

Explain how you completed each column in the table above.

83) Investigation #3 — Stopping the Depression

Objective: After you complete this investigation, you will be able to control GNP in a simple Keynesian model by controlling either the level of taxes or the level of government spending.

Prerequisites: You should have completed investigations #1 and #2.

****

You are to run simulation ECK2 keeping yoursimulated GNP rising by 3% a year. This means that you must start each round by deciding what target GNP should be. Until 1935 you are to achieve this goal by making changes in government spending, leaving taxes at their historical levels. From 1936 until the end you are to reach your target GNP by changing the level of taxes, leaving government spending at its historical level. (To do this, you may need to have a negative level of taxes, which are in effect government subsidies.) In addition to compieting the table, answer the three questions included below.

You may have to rerun the simulation more than once to achieve satisfactory results. If you complete the assignment correctly, you should never be told the levels of inflation and unemployment. Also, when you are finished, you should be told by the computer that you really know your stuff!

(If you are unsure about how to keep GNP rising by 3% a year, run through the entire simulation doing the best you can. Unless you do quite well, the computer will give you some directions at the end on how to stop the Depression.)

1) Explain your strategy for choosing policy.

YEAR	GOVERNMENT SPENDING	TAXES	YOUR SIMULATED GNP	INFLATION	UNEMPLOYMENT
1929					
1930					
1931					
1932					
1933					
1934					
1935					
1936					
1937					
1938					
1939					
1940					

2) Should a believer in this model worry about the political criticism one encounters when running this program (about the deficit and taxes)? Should a politician worry about such criticism?

3) What does the model used in this simulation suggest was the primary cause of the Great Depression?

B4) Investigation #4 — Balanced Budget Multiplier

Objective: After you complete this investigation, you should be able to control GNP in a simple Keynesian model when there are constraints on what combinations of government spending and taxes are allowed. You will also be able to explain the balanced-budget multiplier.

Prerequisites: You should have completed investigation #1. You should also have met, either in class or in your text, an explanation of the balanced-budget multiplier.

****

Run the simulation ECK2 and attempt to make simulated GNP equal target GNP with these limitations: until 1935 any change in government spending must be balanced with a change in taxes so that the budget deficit is not changed, and after 1935 taxes are to be kept constant at 15. When you are finished, explain the strategies you used to choose your policy.

YEAR	TARGET GNP	GOVERNMENT SPENDING	TAXES	SIMULATED GNP
1929	100			
1930	100			
1931	100			
1932	100			
1933	100			
1934	115			
1935	115			
1936	115			
1937	115			
1938	120			
1939	120			
1940	120			

Note: If you complete this exercise properly, the computer will make rude comments and tell you that you do not know what you are doing. Ignore this.

C) Sample Output

The student is a fiscal policymaker in this simulation, reliving the years from 1929 to 1940. Student responses are shown in the boxes.

As you look through the output, you will see three (3) different GNPs. Simulated GNP, or what some investigations call original simulated GNP, is what the simple model used in the simulation predicts would have happened. A second GNP is historical GNP. This tells you what actually happened in the 1930s. It is included so you can see how well the simple model used in the simulation predicts. The final GNP is your simulated GNP. This is the GNP that you control with your decisions.

There are two reasons the simulated GNP and historical GNP differ. First, the model is a simple model, far from a perfect reflection of the real world. Second, there are measurement errors in the data, so even if we had a perfect model, its predictions could differ from measured GNP.

You should note that if you read the instructions in the sample output, you can skip them when you run the program. Also note that when the computer asks for a YES or NO response, you can answer with a Y or N. Further, you can move through the simulation a bit faster if you enter both the government spending and tax decisions together, separated by a comma. You can see this feature in the sample output: compare years 1931 and 1932.

Finally, note the special commands that are available to you, the /STOP, /Restart, and /BACK. Their use is explained and illustrated in this sample output.

```
ECK2

WOULD YOU LIKE AN EXPLANATION OF THIS SIMULATION?
[yes]

THIS SIMULATION USES A SIMPLE KEYNESIAN MODEL, SUCH AS CAN BE FOUND IN
VIRTUALLY ALL PRINCIPLES-OF-MACROECONOMICS TEXTBOOKS, TO EXPLAIN THE
GREAT DEPRESSION.  AS YOU ARE AWARE, IN THE KEYNESIAN MODEL THE LEVEL
OF GNP IS DETERMINED BY THE DEMAND FOR OUTPUT, WHICH IN TURN IS COMPOSED
OF THREE PRIMARY COMPONENTS: CONSUMPTION, INVESTMENT, AND GOVERNMENT
SPENDING.  THE GOVERNMENT CAN INFLUENCE THE LEVEL OF GNP WITH FISCAL
POLICY, THAT IS, BY CHANGING THE LEVEL OF GOVERNMENT SPENDING OR BY
CHANGING TAXES.

HERE IS THE MODEL ON WHICH THIS SIMULATION IS BASED:
     GNP = CONSUMPTION + INVESTMENT + GOVERNMENT SPENDING
     CONSUMPTION = A + B(GNP - TAXES)
     A = 14.9;     B = 2.73
     INVESTMENT TAKES ITS HISTORICAL VALUES
     GOVERNMENT SPENDING IS SET BY THE POLICYMAKER
     TAXES ARE SET BY THE POLICYMAKER
      (INVESTMENT INCLUDES NET EXPORTS.)
DO YOU WANT MORE INFORMATION
[Y]
```

BELOW IS HOW THIS MODEL PREDICTS USING HISTORICAL DATA:

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	SIMULATED GNP	HISTORICAL GNP
1929	17.3	8.8	9.8	74.6	100.7	103.4
1930	10.7	9.3	9.2	63.0	82.7	90.7
1931	6.1	9.5	8.6	60.0	75.6	76.1
1932	1.4	8.7	6.3	48.4	58.1	58.3
1933	1.8	8.2	4.8	48.4	58.4	55.8
1934	3.9	10.0	7.6	54.6	68.5	65.3
1935	5.5	10.2	8.2	59.0	73.7	72.5
1936	8.8	12.2	9.1	65.2	85.9	82.7
1937	12.1	12.9	12.3	65.6	89.7	90.7
1938	7.7	13.2	11.4	61.0	81.9	85.0
1939	10.3	13.8	11.3	67.9	90.8	90.8
1940	14.9	14.2	13.8	73.2	102.3	100.9

HISTORICAL GNP IS WHAT ACTUALLY HAPPENED AND SIMULATED GNP IS WHAT THE SIMPLE KEYNESIAN MODEL USED IN THIS COMPUTER PROGRAM PREDICTS.
DO YOU WANT MORE INFORMATION

why not

I DID NOT UNDERSTAND YOUR ANSWER. I ASSUME YOU MEANT TO ANSWER YES.

EACH YEAR FROM 1929 TO 1940 YOU WILL BE GIVEN RESULTS FROM THIS TABLE AND THEN BE ASKED FOR NEW VALUES OF GOVERNMENT SPENDING AND TAXES, THE TWO TOOLS OF FISCAL POLICY. AFTER YOU ENTER THESE NUMBERS, I WILL PRINT A NEW SIMULATED GNP SHOWING THE EFFECTS OF YOUR DECISIONS.

I EVALUATE YOUR PERFORMANCE ASSUMING THAT YOUR GOAL IS TO PREVENT THE DEPRESSION. TO DO THIS YOU NEED TO KEEP GNP GROWING BY 3% A YEAR IF YOU DO NOT STOP THE DEPRESSION, I GIVE YOU SOME HINTS ABOUT HOW TO STOP IT WHEN YOU FINISH.

WOULD YOU LIKE INFORMATION ABOUT SPECIAL COMMANDS?

Y

THE COMMANDS AVAILABLE ARE:
/STOP OR /S -- TAKES YOU TO END OF PROGRAM.
/RESTART OR /R -- TAKES YOU TO BEGINNING OF PROGRAM.
/BACK OR /B -- LETS YOU REPEAT A YEAR. (YOU MAY ONLY USE THIS COMMAND TWICE BECAUSE I WANT TO DISCOURAGE GUESSING AND CARELESSNESS.)
TO SEE THESE COMMANDS AGAIN DURING THE SIMULATION, TYPE /HELP.

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	SIMULATED GNP	HISTORICAL GNP
1929	17.3	8.8	9.8	74.6	100.7	103.4

HOW MUCH SHOULD THE GOVERNMENT SPEND?

ten

I DO NOT UNDERSTAND YOUR ANSWER. DO YOU NEED HELP?

no

HOW MUCH SHOULD THE GOVERNMENT SPEND?

10

HOW MUCH SHOULD THE GOVERNMENT TAX?

10.

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	YOUR SIMULATED GNP
1929	17.3	10.0	10.0	76.6	103.9

OVERALL YOU DID A GOOD JOB THIS PAST YEAR

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	SIMULATED GNP	HISTORICAL GNP
1930	10.2	9.5	9.2	63.0	82.7	90.7

HOW MUCH SHOULD THE GOVERNMENT SPEND?

13

HOW MUCH SHOULD THE GOVERNMENT TAX?

2

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	YOUR SIMULATED GNP
1930	10.2	13.0	2.0	84.4	107.6

OVERALL YOU DID A GOOD JOB THIS PAST YEAR

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	SIMULATED GNP	HISTORICAL GNP
1931	6.1	9.5	6.6	60.0	75.6	76.1

HOW MUCH SHOULD THE GOVERNMENT SPEND?

12

HOW MUCH SHOULD THE GOVERNMENT TAX?

3

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	YOUR SIMULATED GNP
1931	6.1	12.0	3.0	72.2	90.3

THE LEVEL OF UNEMPLOYMENT WAS 13 PER CENT.
THIS LEVEL OF UNEMPLOYMENT IS UPSETTING THE CITIZENS.

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMP-TION	SIMULATED GNP	HISTORICAL GNP
1932	1.4	8.3	5.5	48.4	58.1	58.3

HOW MUCH SHOULD THE GOVERNMENT SPEND?

10,10.

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMPTION	YOUR SIMULATED GNP
1932	1.4	10.0	10.0	44.8	56.2

THE LEVEL OF UNEMPLOYMENT WAS 28 PER CENT
THIS LEVEL OF UNEMPLOYMENT IS UPSETTING THE CITIZENS.
THEY ARE RIOTING IN THE STREETS!!

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMPTION	SIMULATED GNP	HISTORICAL GNP
1933	1.8	8.2	6.8	46.4	58.4	55.8

HOW MUCH SHOULD THE GOVERNMENT SPEND?

/back

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMPTION	SIMULATED GNP	HISTORICAL GNP
1932	1.4	8.3	6.3	46.4	58.1	58.3

HOW MUCH SHOULD THE GOVERNMENT SPEND?

15,5

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMPTION	YOUR SIMULATED GNP
1932	1.4	15.0	5.0	64.8	81.2

THE LEVEL OF UNEMPLOYMENT WAS 16 PER CENT
THIS LEVEL OF UNEMPLOYMENT IS UPSETTING THE CITIZENS.

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMPTION	SIMULATED GNP	HISTORICAL GNP
1933	1.8	8.2	6.8	46.4	58.4	55.8

HOW MUCH SHOULD THE GOVERNMENT SPEND?

/RESTART

WOULD YOU LIKE AN EXPLANATION OF THIS SIMULATION?

no

YEAR	INVEST-MENT	GOVERNMENT SPENDING	TAXES	CONSUMPTION	SIMULATED GNP	HISTORICAL GNP
1929	17.3	8.8	9.8	74.6	100.7	103.4

HOW MUCH SHOULD THE GOVERNMENT SPEND?

/STOP

THE QUANTITY-THEORY SIMULATION ECM2

"...so far as those top-flight quantity theorists are concerned, opponents were really fighting windmills: as is so often the case in economics they were trying to knock down a creation of their own fancy; they were trying to refute what had never been held...." *

Joseph A. Schumpeter

A) Background

In discussing the income-expenditure model, I noted that prior to 1930 many economists believed that the amount of money in the economy was important in determining total spending. Though this belief has had a life measured in centuries, the best discussion of it before 1930 is in Irving Fisher's The Purchasing Power of Money (MacMillan, 1922; reprinted ed.,Augustus M.Kelly,1971).

Given the long history of the monetary theory of spending, it is surprising that before the middle of the 1960s there were few economists who used a monetary theory to interpret what happened between 1929 and 1940. The revival of the monetary interpretation was largely due to a book written by Milton Friedman and Anna Schwartz called A Monetary History of the United States, 1867-1960 (Princeton Univ. Press, 1963).

There are a number of ways to build monetary models that explain spending. The one I used in the simulation ECM2 is a variant of the Quantity Theory of Money and is based on the equation of exchange. This way of building a monetary model is the easiest to understand and is the way most textbooks explain the theory. But as is the case in the model in ECK2, you should be aware that the model is very simple and few economists accept it as more than a rough approximation of how the world works.

The equation of exchange is an identity, that is, a statement true by definition. It says that the amount of money in circulation multiplied by the average number of times a dollar is spent for final output equals GNP. This means that if one dollar is spent five times a year, that dollar supports five dollars worth of spending. If an economy has 100 of money and each unit of money is spend an average of five times a year for final output, final output (or GNP) will be 500. Written as a equation, the equation of exchange looks like this:

$$MV = Y$$

---

* From History of Economic Analysis, Oxford Univ. Press, 1954, P.1103

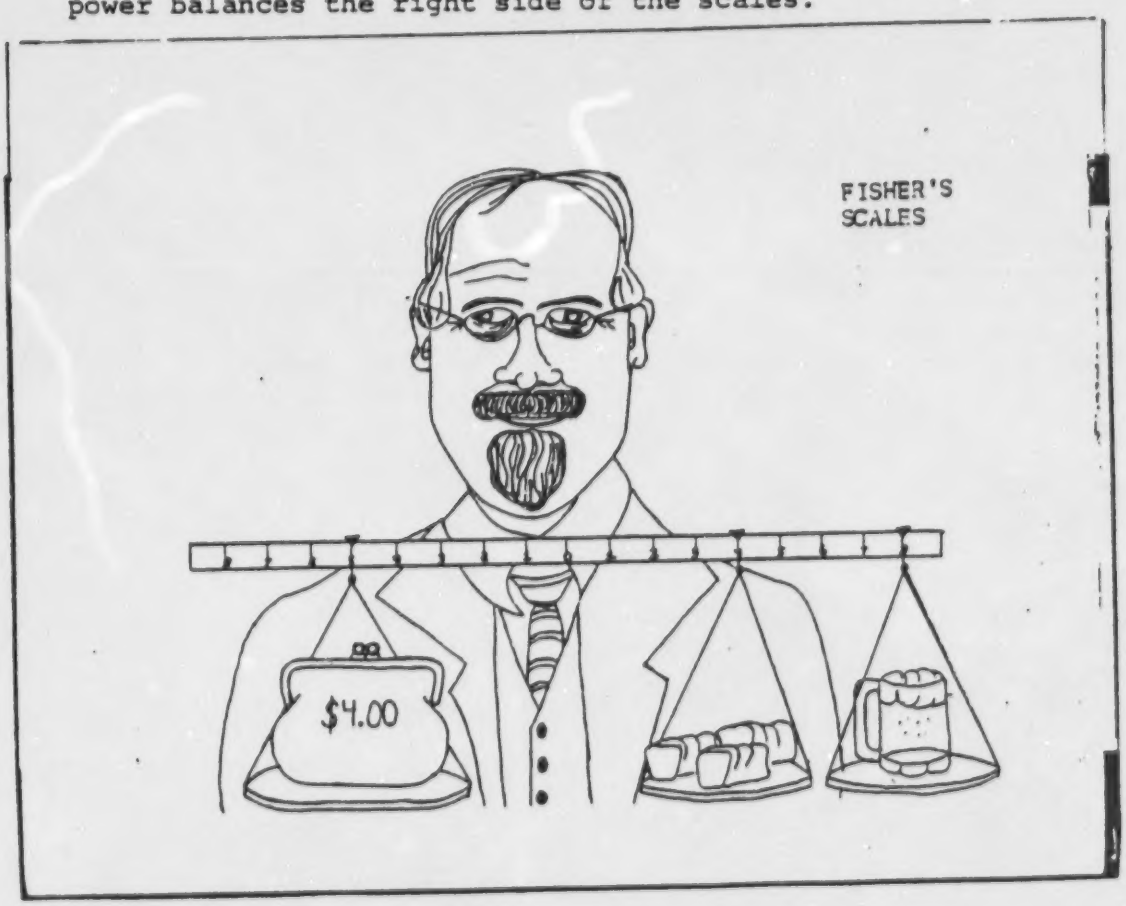
where M is the money stock, V is the velocity of money or the average number of times a dollar circulates, and Y is GNP. Sometimes this equation is written in a different form:

$$M = (1/V)Y \text{ or } M = kY.$$

k can be interpreted as the fraction of income kept in average cash balances.

The principle in the equation of exchange can be explained by an analogy. If we wanted to measure the flow of water past a point on a riverbank, we could multiply the amount of water in a cross section or slice of the river by the rate at which the water flowed. The equation of exchange leads one to see the economy in the same way -- the total flow of purchases equals the amount of money people have multiplied by the speed or rate at which they spent it.

The little sketch below shows Irving Fisher with his way of illustrating the equation of exchange. In this illustration the spending side of the equation of exchange, or MV, is shown on the left of the scales. The purse represents the amount of money in circulation and the distance from the fulcrum to the purse represents the velocity of money. The weight of the purse multiplied by the distance equals the spending power in the economy. This spending power balances the right side of the scales.



On the right distances represent prices of goods and weights of goods represent the amount people buy. Multiplying the amount of each good bought by its price also equals the spending power in the economy. In the example in the picture we get:

$$MV = 4*5 = 20 = (4 \times 3) + (8 \times 1)$$
$$= \text{Prices} * \text{Quantities} = \text{Spending}$$

What will happen if the amount in the purse increases or if the distance from the purse to the fulcrum increases? Spending power will increase. The extra spending power may be used to support more weight or a greater distance, that is, more goods or higher prices.

There are actually several forms of the equation of exchange. One form looks at GNP velocity, or the average number of times a dollar is spent on final output. Another uses transaction velocity, or the average number of times a dollar changes hands for any purpose. In addition, these velocities can be based on different definitions of money -- M-1, M1A, M1B, M-2, new M-2, etc.

It is something of an embarrassment to economists that they are unable to agree on the proper definition of money. Those who argue for the M-1 definition (coin, paper money, and checking-account money) usually argue that only those things which are actually spent, which actually serve as a medium of exchange, should count as money. Those who prefer the M-2 definition (M-1 plus amounts in time deposits at banks) often argue that there seems to be a closer relationship between changes in M-2 and GNP than between M-1 and GNP. They also sometimes argue that funds in savings accounts are <u>almost</u> the same as funds in checking accounts; both are very <u>liquid</u>. The simulation ECM2 does not take a position on the controversy. Rather it lets you decide whether to use M-1 or M-2.

The equation of exchange becomes a theory when one makes assumptions about how the variables in the equation of exchange are related. The best known theory based on the equation of exchange is the Quantity Theory of Money. It says that in the <u>long run</u>, after <u>all</u> adjustments are made, the only relationship between variables will be between money and prices. This means the Quantity Theory predicts that in the long run monetary policy cannot change the amount of goods that the economy produces, but it can and will change prices.

In the <u>short run</u>, however, things are more complex. Moreover the short run, or what Fisher called transition periods, can last several years. During it Fisher said that a change in money could affect velocity and the amount of goods sold as well as prices. Also he said that changes in prices or the amounts of goods sold could change money or velocity, though again these changes would be temporary.

Recall that back in the section "What is a model" (pp.2-3) I said that the models we would discuss only told us about equilibrium, not how we got from one equilibrium to another. If you are observant, you should realize that when we talk about long run, we are talking about equilibrium positions, and when we discuss short run, we are talking about steps on the way to reaching equiibrium. (There are two ways to discuss short run -- as dynamics or as a series of partial-adjustment, short-run equilibria. A discussion of this topic would take us far afield.)

In using the long-run version of the Quantity Theory, we could, for simplicity, assume that velocity is a constant. However this assumption would result in a poor prediction of what actually happened from 1929 to 1940. (You can try it for yourself once you understand the model.) Many monetarists would explain this poor prediction by stating that a given decline in money stock, say a 1% decline, had a larger than proportional effect on GNP, say 1.5%, at least in the short run. So in order to give you a "monetarist" model that will predict well, at least in the period from 1929 to 1940, we will not assume that velocity is constant, but that it falls when money stock falls.

One can contrast the structure of the models in ECM2 and ECK2 by noting that the model in ECM2 is also made up of parts. First, the money stock is determined outside the model by a policymaker. Second, people want to hold money balances equal to some constant fraction of total spending unless total spending falls. In that case they will increase the fraction. Velocity of money is the reciprocal of this fraction. These two parts contain assumptions about how people act. And third, equilibrium exists when money stock multiplied by <u>desired</u> velocity equals income.

The way I am treating velocity is an <u>ad-hoc</u> treatment, one that I am not completely happy with. The advantage of building the model in this way is that it gives us a <u>simple</u> model that has a monetarist flavor and which predicts GNP quite well during the period 1929 to 1940. (Allowing velocity to vary <u>directly</u> with money-stock changes is monetarist. In their study of the history of the U.S. money supply, Milton Friedman and Anna Schwartz found that this direct relationship exists. Irving Fisher wrote that "[d]uring... [a] depression, velocities (V and V') are abnormally low. People are less hasty to spend money or checks when the dollars they represent are rising in purchasing power." (<u>Purchasing Power of Money</u>, p. 68). Keynesians, on the other hand have traditionally predicted an inverse relationship.) The disadvantage of building the model in this way is that there is no good reason not to allow velocity to return to a "normal" value after it has fallen except that a short-run model would be complex and you might find it more confusing than helpful. In other words, in trying to predict short-run movements with a simple long-run model, we have, in this case, a rather peculiar long-run model.

If you would like a short and very readable history of the Quantity Theory and the controversy that has surrounded it, see Thomas M. Humphrey, "The Quantity Theory of Money: Its Historical Evolution and Role in Policy Debates," Economic Review (published by The Federal Reserve Bank of Richmond), May/June 1974, pp. 2-19. For an alternative way to construct a monetary model of GNP determination, one that allows long-run velocity to be constant and short-run velocity to vary, see James R. Lothian, "Comments on 'Monetarist Interpretations of the Great Depression'", in The Great Depression Revisited, edited by Karl Brunner (Boston: Martinus Nijhoff Publishing, 1981), expecially pages 137-40. You may have difficulty understanding the meaning of what Lothian does.

B1) Investigation #5 -- Test of Basic Concepts

Objective: This investigation is a self-test to see if you understand the basic components of the Quantity Theory of Money.

Prerequisites: You should have read the appropriate section of your textbook. If you need further help, use a computer program called ECM1 which will guide you by telling you why wrong answers are incorrect.

---

1. If the money stock is 200 and each unit of money is spent an average of eight times a year on final output, how large will GNP be?

2. If GNP is 100 and V is 5, what must M be?

3. From 1946 to 1972, U.S. GNP rose from $211 billion to $1150 billion and the money stock rose from $106 billion to $246 billion. What can we say about the velocity of circulation?

   a. it fell
   b. it rose
   c. it remained constant
   d. we cannot say anything certain about velocity based on this information.

4. Suppose people decide to keep an average of one tenth of their income in the form of money. What will velocity be?

5. In 1965 the transaction velocity of money was about 30 and the GNP velocity of money was about 4. This meant that a dollar changed hands on the average about every:

   a. 4 days
   b. 12 days
   c. 30 days
   d. 90 days
   e. 120 days

6. The data in the last question (that transaction velocity was about 30 and GNP velocity was 4) also indicate that:

   a. only about one transaction in seven or eight was a transaction to buy final output.
   b. GNP was 30 times as large as the money stock.
   c. M-2 was 7 1/2 times larger than M-1.
   D. The price index was rising at a 71/2% rate.

7. From 1929 to 1933, GNP in the U.S. dropped from $104 billion to $58 billion. What explanation would the Quantity Theory suggest for this decline?

   a. The wrong amount of government spending.
   b. Instability of V.
   c. The stock market crash of 1929.
   d. A reduction in the money stock.
   e. Instability of the market system.

28

B2) Investigation #6 — Using Monetary Policy to Stop The Depression.

Objective: After you finish this investigation, you should be able to control GNP in a simple Quantity-Theory-of-Money model by controlling the money stock.

Prerequisites: You should have successfully completed investigation #5. Also, look at the sample output shown later in this Guide.

****

Run the simulation ECM2, making changes in money stock to control the level of GNP. Your goal is to keep simulated GNP rising 3% a year. If you do this assignment correctly, you should never be told the values of inflation or unemployment. Also, when you finish, the computer should tell you that you really know your stuff! If you have a great deal of trouble, run through the entire simulation and at the end the computer should offer you some hints on how to stop the Depression. (You may have to rerun the simulation more than once to achieve satisfactory results. Also, a hand calculator may help you in this investigation.)

YEAR	MONEY	Your SIMULATED GNP	INFLATION	UNEMPLOYMENT
1929				
1930				
1931				
1932				
1933				
1934				
1935				
1936				
1937				
1938				
1939				
1940				

Explain how you decided what money stock was appropriate.

83) Investigation #7 — Using Monetary Policy (part 2)

Objectives and Prerequisites: Same as in Investigation #6.

****

Run the simulation ECM2, making changes in money stock M-2 to make simulated GNP equal Target GNP. When you have finished the table below, write a short explanation of your strategy as a policymaker. (You may have to rerun the simulation more than once to achieve satisfactory results.)

YEAR	M-2	VELOCITY	YOUR SIMULATED GNP	TARGET GNP
1929				100
1930				110
1931				120
1932				130
1933				120
1934				110
1935				125
1936				130
1937				140
1938				150
1939				160
1940				140

Note: If you complete this assignment correctly, the computer will end by telling you that you do not understand what you are doing. It does this because it assumes that you want to stop the Depression. However, that is not your goal in this assignment. Therefore ignore its comments.

C) Sample Output

In this simulation the student relives the years of the Great Depression as a monetary policymaker. The sample responses of a student are shown in boxes.

The special features of this simulation are explained and demonstrated in this sample run. For an explanation of why three different GNP are computed, see the notes before the sample output of ECK2.

As you look through this sample run, you should see that the velocity of money you will work with may be different from the one in the table for the same year. Also, you can change the definition of the money stock when you start over (using /Restart). This is illustrated in the sample run.

```
ECK2

WOULD YOU LIKE AN EXPLANATION OF WHAT THIS SIMULATION IS ABOUT?
yes
THE EQUATION OF EXCHANGE AND THE QUANTITY THEORY OF MONEY CAN BE USED
TO EXPLAIN PAST EPISODES OF AMERICAN ECONOMIC HISTORY.  I AM GOING TO
SHOW YOU HOW THE PERFORMANCE OF GNP IN THE YEARS SURROUNDING THE GREAT
DEPRESSION CAN BE SIMULATED USING A SIMPLE QUANTITY THEORY OF MONEY.
AFTER YOU SEE HOW THIS MODEL CAN EXPLAIN THE PERIOD (THOUGH BE AWARE
THAT IT IS NOT THE ONLY EXPLANATION POSSIBLE), I WILL GIVE YOU A CHANCE
TO SHOW HOW WELL YOU UNDERSTAND IT BY MAKING YOU THE MONETARY POLICY
MAKER WITH THE GOAL OF PREVENTING THE DEPRESSION.

HERE IS THE MODEL ON WHICH THIS SIMULATION IS BASED:

GNP = MONEY STOCK * VELOCITY OF MONEY
MONEY STOCK IS DETERMINED BY THE POLICYMAKER
VELOCITY IS CONSTANT UNLESS THE MONEY STOCK DECLINES,
      IN WHICH CASE IT DROPS AS WELL.
WOULD YOU LIKE TO SEE HOW WELL THIS MODEL PREDICTS GNP FOR 1929-40?
sure
```

I DID NOT UNDERSTAND YOUR ANSWER. I ASSUME YOU MEANT TO ANSWER YES.

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1929	26.4	3.79	103.9	103.40
1930	25.8	3.65	93.1	90.70
1931	23.5	3.40	79.9	76.10
1932	20.6	3.15	64.9	58.30
1933	19.3	2.90	56.6	55.80
1934	21.5	2.90	62.3	65.30
1935	25.5	2.90	73.9	72.50
1936	29.2	2.90	84.7	82.70
1937	30.2	2.90	87.6	90.70
1938	30.9	2.65	79.5	85.00
1939	33.6	2.65	89.0	90.80
1940	39.9	2.65	103.4	100.00

WOULD YOU LIKE MORE DETAILS

Y

THERE IS SOME DISAGREEMENT AMONG ECONOMISTS ABOUT THE PROPER DEFINITION OF MONEY. SOME ECONOMISTS STRESS THE MEDIUM-OF-EXCHANGE FUNCTION AND THUS PREFER THE M-1 DEFINITION WHICH INCLUDES CURRENCY AND DEMAND DEPOSITS. OTHER ECONOMISTS USE THE M-2 DEFINITION WHICH INCLUDES TIME DEPOSITS. USING M-2, HERE IS A SIMULATION OF THE 1929-40 PERIOD:

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1929	46.6	2.30	107.2	103.40
1930	45.7	2.18	99.6	90.70
1931	42.7	2.06	88.0	76.10
1932	36.1	1.94	70.0	58.30
1933	32.2	1.82	58.6	55.80
1934	34.4	1.82	62.6	65.30
1935	39.1	1.82	71.2	72.50
1936	43.3	1.82	79.2	82.70
1937	45.7	1.82	83.2	90.70
1938	45.1	1.70	76.7	85.00
1939	47.3	1.70	83.8	90.80
1940	55.2	1.70	93.8	100.00

WOULD YOU LIKE TO USE THE M-2 DEFINITION OF MONEY IN THIS SIMULATION?

no

YOU WILL USE M-1.

YOU WILL HAVE A CHANCE TO SEE IF YOU CAN DO BETTER. YOUR GOAL IS TO KEEP GNP GROWING SMOOTHLY AT A MODERATE RATE, ABOUT 3% A YEAR. YOU WILL BE THE SOLE MONETARY POLICYMAKER, ABLE TO SET THE MONEY STOCK AT WHATEVER LEVEL YOU DECIDE.

FOR EACH YEAR YOU WILL BE GIVEN THE RESULTS FROM THE INTRODUCTORY TABLE AND THEN YOU WILL BE ASKED FOR NEW VALUES OF THE MONEY STOCK. I WILL THEN PRINT WHAT GNP RESULTS FROM YOUR DECISION.

WOULD YOU LIKE TO SEE THE SPECIAL COMMANDS THAT ARE AVAILABLE?

[Y]

THE SPECIAL COMMANDS ARE:
/STOP OR /S -- TAKES YOU TO END OF PROGRAM.
/RESTART OR /R -- TAKES YOU TO BEGINNING OF PROGRAM.
/BACK OR /B -- LETS YOU REPEAT A YEAR. (YOU MAY ONLY USE THIS COMMAND ONCE BECAUSE I WANT TO DISCOURAGE GUESSING AND CARELESSNESS.)
YOU CAN SEE THESE COMMANDS AGAIN DURING THE SIMULATION BY TYPING /HELP.

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1929	26.4	3.90	103.0	103.40

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

[28]

YEAR	MONEY	VELOCITY	YOUR SIMULATED GNP
1929	28	3.9	109.2

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1930	25.5	3.65	93.1	90.70

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

[/help]

I WOULD LIKE YOU TO EITHER ENTER A NUMBER OR ONE OF THESE SPECIAL COMMANDS:
/STOP OR /S -- TAKES YOU TO END OF PROGRAM.
/RESTART OR /R -- TAKES YOU TO BEGINNING OF PROGRAM.
/BACK OR /B -- LETS YOU REPEAT A YEAR. (YOU MAY ONLY USE THIS COMMAND ONCE BECAUSE I WANT TO DISCOURAGE GUESSING AND CARELESSNESS.)
WHAT LEVEL OF MONEY STOCK DO YOU WANT?

[30]

YEAR	MONEY	VELOCITY	YOUR SIMULATED GNP
1930	30	3.9	117

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1931	23.5	3.40	79.9	76.10

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

[45]

YEAR	MONEY	VELOCITY	YOUR SIMULATED GNP
1931	45	3.9	175.5

THE RATE OF INFLATION YOU CAUSED WAS 23 PERCENT.
WALL-STREET BANKERS BELIEVE THAT THE COUNTRY WOULD BENEFIT BY YOUR RESIGNATION.
CONGRESS HAS PASSED A RESOLUTION CONDEMNING YOUR POLICIES
AND IRATE HOUSEWIVES ARE LOOTING GROCERY STORES.
THE PRESIDENT HAS SENT YOU A LETTER REQUESTING YOUR RESIGNATION.
HE POINTED OUT THAT PRICES HAVE RISEN BY 40 PERCENT SINCE
YOU BECAME THE MONETARY POLICYMAKER.

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1932	29.6	3.15	64.9	58.30

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

/back

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1931	23.5	3.40	79.9	76.10

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

25

YEAR	MONEY	VELOCITY	YOUR SIMULATED GNP
1931	25	3.65	91.25

THE LEVEL OF UNEMPLOYMENT WAS 15 PERCENT.
A GOOD POLICYMAKER WOULD NOT CAUSE THIS EXCESSIVE UNEMPLOYMENT.
REMEMBER, YOUR GOAL WAS TO STOP THE GREAT DEPRESSION!!

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1932	20.6	3.13	64.9	58.30

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

/back

YOU HAVE ALREADY USED THIS COMMAND ONCE. I WILL NOT LET YOU
USE IT AGAIN BECAUSE I WANT YOU TO BE CAREFUL AND AVOID GUESSING.
HOWEVER, I WILL LET YOU RESTART THE ENTIRE SIMULATION.
WOULD YOU LIKE TO START OVER?

yes

WOULD YOU LIKE TO CONTINUE USING M-1 AS THE MONEY STOCK?

N

WOULD YOU LIKE AN EXPLANATION OF WHAT THIS SIMULATION IS ABOUT?

N

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1929	46.6	2.30	107.2	103.40

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

28

YEAR	MONEY	VELOCITY	YOUR SIMULATED GNP
1929	28	2.3	64.4

THE LEVEL OF UNEMPLOYMENT WAS 23 PERCENT.
A GOOD POLICYMAKER WOULD NOT CAUSE THIS EXCESSIVE UNEMPLOYMENT.
REMEMBER, YOUR GOAL WAS TO STOP THE GREAT DEPRESSION!!

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1930	45.7	2.18	99.6	90.70

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

/back

YEAR	MONEY	VELOCITY	SIMULATED GNP	HISTORICAL GNP
1929	46.6	2.30	107.2	103.40

WHAT LEVEL OF MONEY STOCK DO YOU WANT?

/STOP

MULTIPLE-CHOICE REVIEW QUESTIONS

Choose the most correct answer.

1 During the period from 1933 to 1940, GNP

a. rose in all years.
b. rose except in one year, 1938.
c. declined until 1938, then rose.
d. moved erratically until 1937, then rose.
e. dropped until 1940, when entry into World War II made it begin to rise.

2 As the result of the Great Depression, a view that became quite widespread among economists (and others) in the 1940s and 1950s was that

a. the government should avoid interfering with the economic mechanism and thus prevent another depression.
b. the business cycle was uncontrollable.
c. the market was inherently unstable, and thus needed a large dose of government guidance
d. wage-price controls were an effective way to deal with inflation
e. none of the above

3 In the Keynesian simulation ECK^2, a one dollar increase in government spending

a. increased GNP by three dollars.
b. increased GNP by two dollars.
c. increased GNP by one dollar.
d. did not increase GNP.
e. decreased GNP by one dollar

4 Suppose that when government spending is 10 billion, GNP will be 79 billion. If the government spending multiplier is 3, which of the following combinations would result in a GNP of 100 billion in a simple income-expenditure model?

a. Decrease G by 7, no change in taxes.
b. Decrease G by 21, increase taxes by 7.
c. Increase G by 7, no change in taxes.
d. Increase G by 21, no change in taxes.
e. No change in G, decrease taxes by 7.

5 Suppose an economy does work in the way described by a simple income-expenditure model with a government-spending multiplier of 4 and a tax multiplier of -3. During a year taxes were 11, government spending was 12, and GNP was 100. How large would government spending have had to have been for GNP to equal 120 if taxes were raised to 15?

a. 12
b. 16
c. 17
d. 20
e. 22

Answer the next four questions using this table:

If income is	People will want to: Consume	Save	Pay taxes	Business will want to invest	Government will spend
980	724	148	108	216	50
1030	752	160	118	228	50
1080	780	172	128	240	50
1130	808	184	138	252	50

6 Equilibrium income is

a. 980
b. 1030
c. 1080
d. 1130

7 For equilibrium income to increase by 50, either investment or government spending must increase by

a. 5
b. 10
c. 22
d. 27.5
e. 50

8 The multiplier in this model is

a. 1
b. 1.8
c. 2.3
d. 5
e. 10

9 If income is 980, the government will have a surplus of

a. 44
b. 58
c. 102
d. 166
e. 616

10 The Keynesian view of the period 1929 to 1933 presented in the simulation ECK^2 suggests that the drop in GNP was largely due to:

a. The large increase in the multiplier.
b. The decline in money.
c. The decline in government spending.
d. The decline in investment.
e. The large government deficit.

11 A traditional Keynesian argument states that monetary policy may have limited effectiveness because
   a. Money has no effect on velocity because velocity is a constant
   b. Money and velocity tend to be directly related
   c. Money and velocity tend to be inversely related
   d. The equation of exchange does not hold in reality, so it makes no difference if or how money and velocity are related

12 If total transactions are 400 and transactions velocity is 8, the money stock must be
   a. 50
   b. 392
   c. 408
   d. 3200

13 Which of the following is true of velocity?
   a. Velocity of circulation rose from 1929 to 1933
   b. M-1 velocity was lower than M-2 velocity in 1933
   c. Velocity was constant during the period from 1929 to 1940
   d. Both money stock and velocity declined from 1929 to 1933

ANSWERS: b,c,a,c,d,b,b,d,b,d,c,a,d

DISCUSSION QUESTIONS AND SUGGESTIONS FOR FURTHER STUDY

1) "The interpretation of the Great Depression is a key matter dividing policy activists from nonactivists. The activist view is that the Great Depression was a symptom of an inherently unstable private economy that experienced large gyrations in output....The alternative view is that the Great Depression was in large part a product of governmental mistakes..." (From Robert Barro, American Economic Review, May 1979, p. 57.) An activist policy is one in which the government tries to cure problems. The nonactivist view is that the government should strive to "do no harm."

Explain how the two computer simulations that you have run illustrate the two views of the Depression referred to in the above quotation.

2) One reason to learn about the Depression is that the Depression influenced many of today's ideas and policies. Thus the Depression is of interest because it helps us understand the present. Another reason to study it is that it is interesting in its own right. The problems people of that time faced and their attempts to overcome them are fascinating by themselves. Do you agree that these are valid reasons to study the Depression? Explain. Can you think of specific ideas and government policies which have roots in the Depression?

3) Using a constant velocity (and you can choose whatever constant you like), see how well you can make M-1 predict GNP during the 1930s. How well can you make M-2 predict with a fixed velocity? Which is closer to historical GNP? Why is this an important question in trying to decide whether M-1 or M-2 is the better measure of money stock?

4) Does it matter in ECK2 how the government deficit was financed, that is, whether the funds came from borrowing or from creating new money? Do you think the source of funds should have any effect on importance of fiscal policy?

5) If one has a theory that changes in money stock have no effect on GNP, what sort of behavior must velocity have? How does this compare to the assumption in ECM2? If one has a theory that an increase in government spending has no effect on GNP, what does this imply for the relationship between C+I and G? How does this compare to the assumption in ECK2?

6. Both models discussed in this Guide attempt to explain movements in GNP. Yet at the time of the Depression no one computed GNP. Why do we now consider GNP something worth explaining? What exactly are we measuring with GNP figures? Both in discussing money stock and unemployment rates, I mentioned problems in measuring macroeconomic concepts. How important are the measurement problems in macroeconomics? How reliable are the data with which macroeconomists deal?

7) Why did the money stock drop from 1929 to 1933 and in 1937-38? Could changes in business activity have caused these changes? If a person believes that movements in money are caused in part by changes in income, must that person reject the Quantity Theory?

8) Why did investment move so erratically? Is it reasonable to treat all investment moves as autonomous? Are we really explaining the Depression if we say it was due to changes in investment, but then are unable to explain why these changes in investment took place?

9) The Depression was international in scope. Do these models tell us why?

10) Is it possible that political constraints existed to prevent good policy during the 1930s? Do the simple models used in the simulation suggest anything about this question?

11) Can you develop a model that is a compromise between these two extreme models? If you can develop such a model, what sort of assumptions do you need before it predicts the behavior of GNP from 1929 to 1940?

12.)

Year	Actual GNP	M-1	M-2	Government spending	Taxes	Investment plus net exports
1941	124.9	46.5	62.5	24.9	21.2	19.2
1942	158.3	55.4	71.2	59.8	28.4	10.0
1943	192.0	72.2	89.9	88.9	44.7	3.7
1944	210.5	85.3	106.8	97.0	45.2	5.3
1945	212.3	99.2	126.6	82.8	43.3	10.0
1946	209.6	106.5	138.7	27.6	32.9	38.2
1947	232.8	111.8	146.0	25.5	39.9	45.6
1948	259.1	112.3	148.1	32.0	40.4	52.4
1949	258.0	111.2	147.5	38.4	35.0	41.5
1950	286.2	114.1	150.8	38.5	46.5	55.7

Source of Data: National Income and Product Accounts of the United States 1929-1974 (Department of Economic Analysis, U.S. Department of Commerce) and Historical Statistics of the United States (U.S. Bureau of the Census, 1975).

Use the data in the table above to find the predicted GNPs of the models in ECM2 and ECK2 for the years 1941 to 1950. (This should give you three predicted GNPs because you can use both M-1 and M-2 in ECM2). After you compare the predicted GNPs to actual GNP, decide which model seems to predict the best.

Suggestions for Further Reading

Gottfried Haberler, Prosperity and Depression: A Theoretical Analysis of Cyclical Movements 4th ed. (Cambridge, Mass., Harvard Univ. Press, 1958).

Contains a survey of Pre-Keynesian business-cycle theories.

Kindleberger, Charles P. The World in Depression 1929-1939. Berkeley, Calif.: University of California Press, 1973.

Comprehensive history of the period from a modern Keynesian point of view.

Friedman, Milton and Anna Schwartz, A Monetary History of the United States 1867 - 1960. Princeton, N.J.: Princeton Univ. Press, 1963.

A monetarist interpretation of U.S. macroeconomic history. This book has had a very wide influence. The chapter on the Great Depression has been published separately.

Termin, Peter. Did Monetary Forces Cause the Great Depression?. New York: W.W. Norton and Co., 1976.

Termin argues that they did not, that the onset of the Depression was caused by an unexplained (and perhaps unexplainable) drop in consumption. (This book is rather difficult for a reader who does not have a good background in macroeconimic theory.)

Galbraith, John Kenneth. The Great Crash 1929. Boston: Houghton Mifflin, 1955.

An interpretation of the start of the Depression that does not rely on monetary forces. Written for the noneconomist. Somewhat dated in view of the amount of research done since it was published, but still interesting.

Chandler, Lester. American Monetary Policy, 1928 - 1941. New York: Harper and Row, 1971.

An explanation of what was happening in the Federal Reserve during its early history. Friedman and Schwartz also treat this topic.

Heilbroner, Robert L. The Economic Transformation of America (in collaboration with Aaron Singer). New York: Harcourt, Brace, Jovanovich, 1977 . Chapter 9 contains a presentation that is in harmony with ECK2. Heilbroner argues that the hidden economic problems such as financial speculation, farm problems, and a maldistribution of wealth contributed to the collapse in investment that caused the Depression.

Wanniski, Jude. The Way the World Works: How Economics Fail and Succeed. Basic Books, 1978.

In chapter 7 argues that the stock market behaved as an efficient market in 1929, reacting to news of a tax called the Hawley-Smoot Tariff Act. Wanniski also tries to explain the Depression from the supply side, but does not clearly explain why nominal income should have fallen.

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LISTP
```

BASIC PROGRAM

```
00001 | PROGRAM WRITTEN IN IDF (HEWLETT PACKARD AUTHORING LANGUAGE) IN 1978.
00002 | REWRITTEN IN BASIC IN 1979. REWRITTEN IN IBM S34 BASIC IN 1982.
00003 | THE AUTHOR IS DR. ROBERT E. SHENK. DURING 1978-80 PARTIAL FUNDING
00004 |FOR DEVELOPING THIS MATERIAL WAS PROVIDED BY THE NATIONAL SCIENCE FOUNDATIO
00005 | UNDER GRANT SER78-00065
00006 | LAST REVISION JANAURY, 1982
00020 DIM R$*72,T$*72,A$*13
00030 DIM B$*13,C$*13,D$*14
00040 F9=1
00499 PRINT NEWPAGE
00500 PRINT "THIS LESSON IS INTENDED TO HELP YOU UNDERSTAND THE EQUATION OF "
00502 PRINT "EXCHANGE AND THEORY OF INFLATION AND UNEMPLOYMENT WHICH IS BASED"
00504 PRINT "ON THIS EQUATION CALLED THE QUANTITY THEORY OF MONEY."
00506 PRINT
00508 PRINT "IF YOU WANT TO REPEAT A SECTION OR SKIP SECTIONS, YOU CAN SHIFT TO"
00510 PRINT "WHICHEVER OF THE 7 SECTIONS YOU WANT BY TYPING IN /BACK WHEN I ASK"
00512 PRINT "FOR A RESPONSE. TO STOP AT ANY POINT, TYPE IN /STOP. IF YOU HAVE NO "
00514 PRINT "IDEA OF WHAT THE CORRECT ANSWER IS, GUESS AND THE COMPUTER WILL "
00516 PRINT "EXPLAIN WHY YOUR ANSWER IS WRONG."
00520 INPUT "TYPE GO ON AND HIT ENTER WHEN YOU ARE READY TO CONTINUE.": R$
00524 PRINT NEWPAGE
00535 PRINT "#1"
00540 PRINT "THE EQUATION OF EXCHANGE IS AN IDENTITY, THAT IS, A STATEMENT TRUE"
00550 PRINT "BY DEFINITION. IT SAYS THAT THE AMOUNT OF MONEY IN CIRCULATION"
00560 PRINT "MULTIPLIED BY TH  AVERAGE NUMBER OF TIMES A DOLLAR IS SPENT FOR "
00570 PRINT "FINAL OUTPUT EQ   S GNP. THUS IF AN ECONOMY HAS A MONEY STOCK OF 100"
00580 PRINT "AND EACH UNIT OF MONEY IS SPENT AN AVERAGE OF FIVE TIMES A YEAR, GNP"
00590 PRINT "WILL BE 500."
00595 PRINT
01010 PRINT "IF THE MONEY STOCK IS 200 AND EACH UNIT OF MONEY IS SPENT AN AVERAGE
01015 PRINT "OF EIGHT TIMES A YEAR, HOW LARGE WILL GNP BE? (ENTER A NUMBER)"
01020 GOSUB 7000
01025 IF V9=1600 THEN 1050
01030 PRINT "INCORRECT. 200 MULTIPLIED BY 8 EQUALS 1600."
01035 GOTO 1102
01050 PRINT "VERY GOOD."
01100 | START OF SECTION 2 **********************************************2222222
01102 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
01103 PRINT NEWPAGE
01104 PRINT "#2"
01105 PRINT "PUTTING THIS IDEA INTO EQUATION FORM GIVES US THE EQUATION OF "
01110 PRINT "EXCHANGE: MV = Y "
01115 PRINT "WHERE M IS THE MONEY STOCK, V IS THE VELOCITY OF MONEY OR THE"
01120 PRINT "AVERAGE NUMBER OF TIMES A DOLLAR CIRCULATES, AND Y IS GNP. SOMETIMES"
01125 PRINT "THIS EQUATION IS WRITTEN IN DIFFERENT FORM:"
01135 PRINT "K CAN BE INTERPRETED AS THE FRACTION OF INCOME KEPT IN AVERAGE"
01140 PRINT "CASH BALANCES."
01145 PRINT
01150 PRINT "IF GNP IS 100 AND V IS 5, WHAT MUST M BE?",
01155 GOSUB 7000
01160 IF V9<>20 THEN 1180
01165 PRINT "CORRECT."
01168 GOTO 1202
```

```
OGRAM NAME: EC41
SYSTEM/34 BASIC -- RELEASE 07
SEP

1180 PRINT "INCORRECT. THE CORRECT ANSWER WAS 20. THE EQUATION ABOVE STATED"
1184 PRINT "THAT M = (1/V)Y, SO SUBSTITUTING IN THE NUMBERS GIVEN WE GET"
1186 PRINT "M = (1/5)100 = 20."
1200 ! START OF SECTION 3 ********** MULTIPLE CHOICE **********3333333
1202 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
1203 PRINT NEWPAGE
1205 PRINT "#3"
1304 PRINT "#3"
1305 GOTO 1310
1306 INPUT "PRESS C AND ENTER  TO CONTINUE.": CONT$
1307 PRINT NEWPAGE
1310 PRINT "FROM 1964 TO 1972, U.S. GNP ROSE FROM $211 BILLION TO $1150 BILLION"
1315 PRINT "AND THE MONEY STOCK ROSE FROM $106 BILLION TO $246 BILLION. WHAT"
1320 PRINT "CAN WE SAY ABOUT THE VELOCITY OF CIRCULATION?"
1325 PRINT "A. IT FELL."
1330 PRINT "B. IT ROSE."
1340 PRINT "C. IT REMAINED CONSTANT."
1345 PRINT "D. WE CANNOT SAY ANYTHING CERTAIN ABOUT VELOCITY BASED ON THIS"
1350 PRINT "   INFORMATION."
1355 GOSUB 7500
1356 A=A+1
1360 IF R$(1:1)<>"B" THEN 1370
1363 PRINT "CORRECT. IT ROSE ROUGHLY 2 TO MORE THAN 4."
1365 GOTO 1455
1370 IF A=3 THEN 1420
1371 IF R$(1:1)<>"A" THEN 1380
1375 PRINT "INCORRECT. BY REARRANGING NUMBERS IN THE EQUATION OF EXCHANGE, WE"
1377 PRINT "SEE THAT V = Y/M. LOOK AT THE NUMBERS AND TRY AGAIN."
1378 GOTO 1306
1380 IF R$(1:1)<>"C" THEN 1386
1381 GOTO 1375
1386 IF R$(1:1)<>"D" THEN 1410
1388 PRINT "INCORRECT. THE DATA IN THIS QUESTION, WHEN PUT INTO THE EQUATION"
1390 PRINT "OF EXCHANGE, DO TELL US WHETEHER PEOPLE WERE SPENDING MONEY FASTER"
1395 PRINT "IN 1946 OR IN 1972. TRY AGAIN."
1397 GOTO 1306
1410 PRINT "ANSWER A, B, C OR D."
1415 GOTO 1306
1420 PRINT "THE CORRECT ANSWER IS B."
1450 ! START OF SECTION 4 ********** NUMBER ANSWER **********4444444
1455 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
1456 PRINT NEWPAGE
1459 PRINT "#4"
1460 A=0
1465 PRINT "SUPPOSE PEOPLE DECIDE TO KEEP AN AVERAGE OF ONE TENTH OF THEIR INCOME"
1470 PRINT "IN THE FORM OF MONEY. WHAT WILL VELOCITY BE? (ENTER A NUMBER.)"
1485 GOSUB 7000
1490 A=A+1
1495 IF V9<>10 THEN 1520
1500 PRINT "CORRECT."
1505 GOTO 1600
1520 IF A=2 THEN 1550
1525 PRINT "INCORRECT. THE QUESTION SAYS M/Y = 1/10. VELOCITY = Y/M. USE YOUR"
```

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01530 PRINT "ALGEBRA AND TRY AGAIN."
01535 GOTO 1465
01550 PRINT "THE CORRECT ANSWER IS 10."
01600 ! START OF SECTION 5 ********** A B C D ANSWER **********555555555
01602 A=0
01603 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
01604 PRINT NEWPAGE
01605 PRINT "#5"
01610 PRINT "THERE ARE ACTUALLY SEVERAL FORMS OF THE EQUATION OF EXCHANGE. ONE"
01615 PRINT "FORM LOOKS AT GNP VELOCITY, OR THE AVERAGE NUMBER OF TIMES A "
01620 PRINT "DOLLAR IS SPENT ON FINA OUTPUT. ANOTHER USES TRANSACTION VELOCITY, OR"
01625 PRINT "THE AVERAGE NUMBER OF TIMES A DOLLAR CHANGES HANDS FOR ANY PURPOSE."
01630 PRINT "IN ADDITION, THESE VELOCITIES CAN BE BASED ON DIFFERENT DEFINITIONS"
01635 PRINT "OF MONEY -- M-1, M-2, M-3, ETC."
01645 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
01646 PRINT NEWPAGE
01650 PRINT "IN 1965 THE TRANSACTION VELOCITY OF MONEY WAS ABOUT 30 AND THE GNP"
01655 PRINT "VELOCITY OF MONEY WAS ABOUT 4. THIS MEANT THAT ON THE AVERAGE"
01660 PRINT "EACH DOLLAR CHANGED HANDS EVERY ?"
01665 PRINT "A. 4 DAYS."
01670 PRINT "B. 12 DAYS."
01675 PRINT "C. 30 DAYS."
01680 PRINT "D. 90 DAYS."
01685 PRINT "E. 120 DAYS."
01690 GOSUB 7500
01695 A=A+1
01700 IF R$(1:1)<>"B" THEN 1720
01705 PRINT "CORRECT. A VELOCITY OF 30 TIMES A YEAR MEANS THAT ON THE AVERAGE "
01710 PRINT "EACH DOLLAR CHANGES HANDS EVERY 12 DAYS (365/30 = ABOUT 12).".
01715 GOTO 1800
01720 IF A=4 THEN 1790
01725 IF R$(1:1)<>"A" THEN 1735
01728 PRINT "INCORRECT. IF EACH DOLLAR CHANGED HANDS EVERY FOUR DAYS ON THE "
01730 PRINT "AVERAGE, VELOCITY WOULD BE 365/4 OR OVER 91. TRY AGAIN."
01732 GOTO 1650
01735 IF R$(1:1)<>"C" THEN 1750
01740 PRINT "INCORRECT. IF EACH DOLLAR CHANGED HANDS EVERY MONTH ON THE AVERAGE,
01745 PRINT "VELOCITY WOULD BE ABOUT 12. TRY AGAIN."
01746 GOTO 1650
01750 IF R$(1:1)<>"D" THEN 1765
01754 PRINT "THIS WOULD BE CORRECT IF WE WERE INTERESTED IN HOW OFTEN EACH "
01756 PRINT "DOLLAR CHANGED HANDS FOR FINAL OUTPUT. BUT I WAS ASKING ABOUT ALL"
01758 PRINT "TRANSACTIONS. TRY AGAIN."
01760 GOTO 1650
01765 IF R$(1:1)<>"E" THEN 1780
01770 PRINT "INCORRECT. FOR THIS ANSWER TO BE CORRECT, VELOCITY WOULD HAVE TO "
01775 PRINT "BE ABOUT 3. TRY AGAIN."
01777 GOTO 1650
01780 PRINT "ANSWER A ,B, C, D, OR E ONLY."
01785 GOTO 1690
01790 PRINT "THE CORRECT ANSWER IS B."
01800 !START OF SECTION 6 ********** MULT CHOICE ****** 3 TRIES *****66666
01810 A=0
```

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LIST


01814 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
01815 PRINT NEWPAGE
01816 PRINT "#6"
01820 PRINT "THE DATA IN THE LAST QUESTION (THAT TRANSACTION VELOCITY WAS 30 "
01825 PRINT "AND GNP VELOCITY WAS 4) ALSO INDICATE THAT :"
01830 PRINT "A. ONLY ABOUT ONE TRANSACTION IN SEVEN OR EIGHT WAS A TRANSACTION"
01835 PRINT "    TO BUY FINAL OUTPUT."
01840 PRINT "B. GNP WAS 30 TIMES AS LARGE AS THE MONEY STOCK."
01845 PRINT "C. M-2 WAS 7 1/2 TIMES LARGER THAN M-1."
01850 PRINT "D. THE PRICE INDEX WAS RISING AT A 7 1/2% RATE."
01860 GOSUB 7500
01865 A=A+1
01870 IF R$(1:1)<>"A" THEN 1890
01875 PRINT "CORRECT."
01880 GOTO 2000
01890 IF A=3 THEN 1930
01900 IF R$(1:1)<>"B" THEN 1920
01905 PRINT "INCORRECT. TRY AGAIN."
01910 GOTO 1820
01920 IF R$(1:1)<>"C" THEN 1950
01935 PRINT "INCORRECT. THERE IS NO INFORMATION ABOUT M-2 VELOCITY GIVEN ABOVE."
01937 PRINT "TRY AGAIN."
01940 GOTO 1820
01950 IF R$(1:1)<>"D" THEN 1970
01955 PRINT "INCORRECT. THERE IS NO INFORMATION ABOUT THE PRICE INDEX GIVEN"
01960 PRINT "QUESTION. TRY AGAIN."
01965 GOTO 1820
01970 PRINT "ANSWER A, B, C OR D ONLY."
01975 GOTO 1860
01980 PRINT "THE CORRECT ANSWER WAS A."
02000 !START OF SECTION 7 ********** MULTIPLE CHOICE ******************777777
02010 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
02011 PRINT NEWPAGE
02013 PRINT "#7 LAST SECTION."
02014 A=0
02015 PRINT "THE EQUATION OF EXCHANGE BECAME IMPORTANT WHEN PEOPLE SAW A"
02020 PRINT "RELATIONSHIP BETWEEN THE QUANTITY OF MONEY AND THE BUSINESS ACTIVITY."
02025 PRINT "SOME OF THESE PEOPLE ARGUED THAT CHANGES IN MONEY CAUSED CHANGES IN"
02030 PRINT "BUSINESS. THEY SAID THAT Y WAS FAIRLY STABLE AND THAT CAUSATION"
02035 PRINT "RAN FROM M TO Y. PUTTING THESE RESTRICTIONS ON THE EQUATION OF"
02040 PRINT "EXCHANGE GIVES US WHAT IS CALLED THE QUANTITY THEORY OF MONEY."
02050 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
02052 PRINT NEWPAGE
02055 PRINT "FROM 1929 TO 1933, GNP IN THE U.S. DROPPED FROM $104 BILLION TO"
02060 PRINT "$58 BILLION. WHAT EXPLANATION WOULD THE QUANTITY THEORY SUGGEST"
02065 PRINT "FOR THIS DECLINE?"
02070 PRINT "A.   WRONG AMOUNT OF GOVERNMENT SPENDING."
02075 PRINT "B.   INSTABILITY OF V."
02080 PRINT "C.   THE STOCK MARKET CRASH OF 1929."
02085 PRINT "D.   A REDUCTION IN THE MONEY STOCK."
02090 PRINT "E.   INSTABILITY OF MARKET SYSTEM."
02100 GOSUB 7500
02102 A=A+1
```

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


02110 IF R$(1:1)<>"D" THEN 2130
02115 PRINT "CORRECT. IN FACT THE MONEY STOCK DID DECREASE BY ABOUT 25% DURING"
02118 PRINT "THESE YEARS, AND MONETARISTS ARGUE THAT THIS WAS THE CAUSE OF THE"
02120 PRINT "GREAT DEPRESSION. SOME NON-MONETARISTS, HOWEVER, ARGUE THAT THIS"
02122 PRINT "DECLINE IN MONEY WAS CAUSED BY, RATHER THAN CAUSED, THE DROP IN GNP"
02125 GOTO 2200
02130 IF A=4 THEN 2190
02132 IF R$(1:1)<>"A" THEN 2150
02134 PRINT "INCORRECT. THE QUANTITY THEORY IMPLIES THAT CHANGES IN GOVERNMENT"
02136 PRINT "SPENDING ARE NOT AN IMPORTANT FACTOR IN DETERMINING SHORT-RUN "
02138 PRINT "CHANGES. TRY AGAIN."
02140 GOTO 2050
02150 IF R$(1:1)<>"B" THEN 2160
02152 PRINT "INCORRECT. THE QUANTITY THEORY SUGGESTS THAT V IS RELATIVELY STABLE."
02154 PRINT "THOUGH V DID DECLINE DURING THE EARLY 1930'S, THIS DECLINE WAS NOT"
02156 PRINT "LARGE ENOUGH TO EXPLAIN MOST OF THE DROP IN GNP. TRY AGAIN."
02158 GOTO 2050
02160 IF R$(1:1)<>"C" THEN 2170
02162 PRINT "INCORRECT. THE QUANTITY THEORY DOES NOT INCLUDE THE STOCK MARKET "
02164 PRINT "AS AN IMPORTANT VARIABLE. TRY AGAIN."
02165 GOTO 2100
02166 GOTO 2050
02170 IF R$(1:1)<>"E" THEN 2180
02172 PRINT "INCORRECT. SOME ECONOMISTS HAVE ARGUED THAT THIS WAS THE CAUSE"
02174 PRINT "OF THE GREAT DEPRESSION OF THE 1930'S, BUT THEY ARE NOT QUANTITY"
02176 PRINT "THEORIST. TRY AGAIN."
02178 GOTO 2050
02180 PRINT "ANSWER A, B, C, D OR E."
02190 PRINT "THE CORRECT ANSWER IS D."
02200 PRINT
02204 PRINT "                                ********************  "
02205 INPUT "PRESS C AND ENTER  TO CONTINUE.": CONT$
02206 PRINT NEWPAGE
02210 PRINT "IN THIS LESSON YOU REVIEWED:"
02215 PRINT "     A) THE DEFINITION OF THE EQUATION OF EXCHANGE;"
02220 PRINT "     B) THE DISTINCTION BETWEEN TRANSACTION AND GNP OR"
02222 PRINT "          INCOME VELOCITY; AND"
02225 PRINT "     C) HOW PUTTING RESTRICTIONS ON THE EQUATION OF EXCHANGE"
02230 PRINT "          CAN YIELD A THEORY OF TOTAL SPENDING."
02500 STOP
07000 INPUT R$
07001 ! SUBROUTINE ENTERS A NUMBER, CHECKS FOR SPECIAL COMMANDS, REUTURS NUMBER
07020 ! GO TO BLANK/UPSHIFT
07030 GOSUB 9844
07040 ! GO-TO SPECIAL
07050 GOSUB 9792
07051 R9=R9+1
07055 ON R9 GOTO 7070,7060,7300,7900
07060 PRINT "PLEASE ENTER A NUMBER ",
07065 GOTO 7000
07069 ! GO TO VALUE
07070 GOSUB 9108
07075 IF R9<3 THEN 7310
```

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


07080 PRINT "YOUR ANSWER IS NOT A NUMBER. PLEASE TRY AGAIN."
07090 GOTO 7000
07300 GOTO 2500
07310 RETURN
07500 INPUT R$
07532 GOSUB 9844
07540 GOSUB 9792
07542 IF R9=2 THEN 7300
07543 IF R9=3 THEN 7900
07545 RETURN
07900 ! /BACK ROUTINE
07910 PRINT "WHICH SECTION DO YOU WANT TO TAKE?"
07920 GOSUB 7000
07930 V9=INT(V9)
07940 IF V9<1 THEN 7970
07955 ! ******** COMPUTED GOTO
07959 IF V9>7 THEN 7970
07960 ON V9 GOTO 535,1100,1200,1450,1600,1800,2000
07970 PRINT "THAT IS NOT A LEGAL SECTION. TRY A NUMBER BETWEEN 1 AND 7."
07980 GOTO 7910
09108  A$="0123456789.+-"
09110 P5=1
09111 ! POSITIVE / NEGATIVE INDICATOR
09112 D5=0
09113 ! DECIMAL YET? INDICATOR
09114 D6=0
09115 ! DECIMAL COUNTER
09116 V9=0
09118 R5=0
09119 ! VALUE YET? INDICATOR
09120 R9=0
09126 FOR H4=F9 TO LEN(R$)
09128 J5=0
09130 J5=J5+1
09132 IF R$(H4:H4)=A$(J5:J5) THEN 9140
09134 IF J5=13 THEN 9200
09136 GOTO 9130
09140 J5=J5-1
09142 IF J5<10 THEN 9170
09144 IF J5>10 THEN 9190
09145 ! HAVE FOUND A DECIMAL
09146 IF D5=1 THEN 9200
09148 D5=1
09150 GOTO 9240
09170 IF D5=1 THEN 9180
09172 V9=V9*10+J5
09173 R5=1
09174 IF V9<9-30 THEN 9240
09176 R9=3
09178 GOTO 9280
09180 D6=D6+1
09181 IF D6<6 THEN 9185
09182 R9=3
```

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


09183 GOTO 9280
09185 V9=V9+J5/(10¬06)
09186 R5=1
09187 GOTO 9240
09190 IF H4>1 THEN 9200
09192 IF J5=11 THEN 9240
09194 P5=-1
09196 GOTO 9240
09200 IF R5=0 THEN 9220
09202 R9=1
09203 ! R9=1 MEANS INCOMPLETE NUMBER
09204 GOTO 9280
09220 R9=4
09221 ! MEANS INVALID NUMBER
09222 GOTO 9300
09240 NEXT H4
09280 V9=V9*P5
09300 RETURN
09792 R9=0
09794 IF R$(1:2)="/H" THEN 9800
09795 IF R$(1:2)="/H" THEN 9800
09796 IF R$="HELP" THEN 9800
09797 IF R$(1:3)="//H" THEN 9800
09798 IF R$(1:1)<>"?" THEN 9804
09800 R9=1
09802 GOTO 9818
09804 IF R$(1:2)="/S" THEN 9806
09805 IF R$="//STOP" THEN 9808
09806 IF R$<>"/STOP" THEN 9812
09810 GOTO 9818
09812 IF R$(1:2)="/B" THEN 9816
09814 IF R$(1:2)<>"/B" THEN 9818
09816 R9=3
09818 RETURN
09844 LET A$="ABCDEFGHIJKLM"
09845 LET C$="NOPQRSTUVWXYZ"
09846 B$="ABCDEFGHIJKLM"
09847 D$="NOPQRSTUVWXYZ"
09848 T$=" "
09849 J5=1
09850 FOR H4=1 TO LEN(R$)
09852 IF R$(H4:H4)=" " THEN 9860
09854 T$(J5:J5)=R$(H4:H4)
09856 J5=J5+1
09860 NEXT H4
09862 ! OUTPUT IN T HAS BLANKS REMOVED. NOW TO UPSHIFT
09866 FOR H4=1 TO LEN(T$)
09868 FOR J5=1 TO 13
09870 IF T$(H4:H4)=B$(J5:J5) THEN 9876
09871 IF T$(H4:H4)=D$(J5:J5) THEN 9874
09872 NEXT J5
09873 GOTO 9878
09874 T$(H4:H4)=C$(J5:J5)
```

```
PROGRAM NAME: ECM1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


09875 GOTO 9878
09876 T$(H4:H4)=A$(J5:J5)
09878 NEXT H4
09880 R$=T$
09998 RETURN
09999 END
```

```
PROGRAM NAME: EC42
SYSTEM/34 BASIC -- RELEASE 07
LISTP


00010 ! PROGRAM WRITTEN IN SUMMER 1977 WITH NUMEROUS REVISIONS SINCE THEN
00020 ! LATEST REVISIONS JAN 13,1981
00030 ! WRITTEN BY DR. ROBERT E. SHENK
00040 ! WORK ON THIS MATERIAL WAS PARTIALLY FUNDED BY THE NATIONAL SCIENCE
00050 ! FOUNDATION UNDER GRANT SER78-00065.
00230 DIM F(13),M(13),Y(13),N(13)
00240 DIM V(13),W(13),H(13),P(13)
00250 DIM R$*72,A$*14,T$*72,D$*14,M$*72
00252 DIM B$*14,C$*14
00255 A7=1:W6=0:F9=1:G1=100
00256 ! IF A7=1 THEN COMMENTS ARE OMITTED
00290 Y(1)=100
00300 P(1)=1
00310 M(1)=5
00320 N(1)=5
00330 F(1)=5
00340 ! SINCE MONEY VALUES ARE LAGGED, THE PROGRAM USES 13 VALUES TO PREDICT
00350 ! 12 GNPS. THE FIRST VALUE, SET ABOVE, IS USED ONLY LAGGING.
00360 FOR J=1 TO 12
00370 READ M(J+1),H(J),F(J+1)
00380 DATA 26.4,103.4,46.6,25.5,90.7,45.7,23.5,76.1,42.7
00390 DATA 20.6,58.3,36.1,19.5,55.8,32.2,21.5,65.3,34.4
00400 DATA 25.5,72.5,39.1,29.2,82.7,43.5,30.2,90.7,45.7
00410 DATA 30,85,45.1,33.6,90.8,49.3,39,100,55.2
00420 NEXT J
00430 ! SOURCES OF DATA: THE NATIONAL INCOME AND PRODUCT ACCOUNTS OF THE U.S.,
00440 ! 1929-74, STATISTICAL TABLES (DEPARTMENT OF ECONOMIC ANALYSIS, U.S. DPT
00450 ! OF COMMERCE) P 324. SLIGHTLY DIFFERENT DATA CAN BE FOUND IN
00460 ! HISTORICAL STATISTICS OF THE UNITED STATES, PP. 229-30
00470 ! ALSO, LESTER CHANDLER, AMERICAN MONETARY POLICY, 1929-1941 (HARPER ROW,
00480 ! 1971) M-2 DATA DATA FROM HISTORICAL STATISTICS OF THE UNITED STATES,
00490 ! PART 2, U.S. BUREAU OF THE CENSUS, 1975, P. 992.
00500 PRINT ,NEWPAGE,"WOULD YOU LIKE AN EXPLANATION OF WHAT THIS SIMULATION "
00505 PRINT "IS ABOUT?"
00510 F6=0
00520 P8=0
00530 GOSUB 7300
00540 IF R8=2 THEN 1220
00550 PRINT "THE EQUATION OF EXCHANGE AND THE QUANTITY THEORY OF MONEY CAN BE "
00560 PRINT "USED TO EXPLAIN PAST EPISODES OF AMERICAN ECONOMIC HISTORY. I AM"
00570 PRINT "GOING TO SHOW YOU HOW THE PERFORMANCE OF GNP IN THE YEARS "
00580 PRINT "SURROUNDING THE GREAT DEPRESSION CAN BE SIMULATED USING A SIMPLE"
00590 PRINT "QUANTITY THEORY OF MONEY. AFTER YOU SEE HOW THIS MODEL CAN EXPLAIN"
00595 PRINT "THE PERIOD (THOUGH BE AWARE THAT IT IS NOT THE ONLY EXPLANATION "
00600 PRINT "POSSIBLE), I WILL GIVE YOU A CHANCE TO SHOW HOW WELL YOU UNDERSTAND"
00610 PRINT "IT BY MAKING YOU MONETARY POLICY MAKER WITH THE GOAL OF PREVENTING"
00620 PRINT "THE DEPRESSION."
00630 INPUT " PRESS C AND ENTER TO CONTINUE ": CONT$
00635 PRINT ,NEWPAGE
00640 PRINT "HERE IS THE MODEL ON WHICH THIS SIMULATION IS BASED:"
00650 PRINT
00660 PRINT "GNP = MONEY STOCK * VELOCITY OF MONEY "
00670 PRINT "MONEY STOCK IS DETERMINED BY THE POLICYMAKER"
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


00680 PRINT "VELOCITY IS CONSTANT UNLESS THE MONEY STOCK DECLINES,"
00690 PRINT "IN WHICH CASE IT DROPS AS WELL."
00700 PRINT "WOULD YOU LIKE TO SEE HOW WELL THIS MODEL PREDICTS GNP FOR 1929-40?"
00710 GOSUB 7390
00720 IF R8=2 THEN 1220
00730 GOSUB 2350
00740 PRINT ,NEWPAGE
00750 GOSUB 2190
00760 FOR J=1 TO 8
00770 GOSUB 2210
00780 NEXT J
00790 PRINT
00791 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00792 PRINT ,NEWPAGE
00793 GOSUB 2350
00794 GOSUB 2190
00795 FOR J=9 TO 12
00796 GOSUB 2210
00797 NEXT J
00798 PRINT
00800 PRINT "WOULD YOU LIKE MORE DETAILS",
00810 GOSUB 7390
00820 IF R8=2 THEN 1220
00830 W6=1
00840 GOSUB 2350
00845 PRINT ,NEWPAGE
00850 PRINT "THERE IS SOME DISAGREEMENT AMONG ECONOMISTS ABOUT THE PROPER DEFINI-"
00860 PRINT "TION OF MONEY. SOME ECONOMISTS STRESS THE MEDIUM OF EXCHANGE "
00870 PRINT "FUNCTION AND THUS PREFER THE M-1 DEFINITION WHICH INCLUDES CURRENCY"
00880 PRINT "AND DEMAND DEPOSITS. OTHER ECONOMISTS USE THE M-2 DEFINITION WHICH "
00890 PRINT "INCLUDES TIME DEPOSITS. USING M-2, HERE IS A SIMULATION OF THE "
00895 PRINT " 1929-40 PERIOD:"
00898 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00899 PRINT ,NEWPAGE
00900 GOSUB 2190
00910 FOR J=1 TO 8
00920 GOSUB 2210
00930 NEXT J
00931 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00932 PRINT ,NEWPAGE
00933 GOSUB 2190
00934 FOR J=9 TO 12
00935 GOSUB 2210
00936 NEXT J
00937 PRINT
00940 PRINT "WOULD YOU LIKE TO USE THE M-2 DEFINITION OF MONEY IN THIS SIMULATION"
00950 GOSUB 7390
00960 IF R8=2 THEN 1000
00970 PRINT "YOU WILL USE M-2."
00980 W6=1
00990 GOTO 1020
01000 PRINT "YOU WILL USE M-1."
01010 W6=0
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01020 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01021 PRINT ,NEWPAGE
01025 IF A7=1 THEN 1080
01030 PRINT "YOU WILL HAVE A CHANCE TO SEE IF YOU CAN DO BETTER. YOUR GOAL IS"
01040 PRINT "TO KEEP GNP GROWING SMOOTHLY AT A MODERATE RATE, ABOUT 3% A YEAR."
01050 PRINT "YOU WILL BE THE SOLE MONETARY POLICYMAKER, ABLE TO SET THE MONEY"
01060 PRINT "STOCK AT WHATEVER LEVEL YOU DECIDE."
01070 PRINT
01080 PRINT "  FOR EACH YEAR YOU WILL BE GIVEN THE RESULTS FROM THE INTRODUCTORY"
01090 PRINT "TABLE AND THEN YOU WILL BE ASKED FOR NEW VALUES OF THE MONEY STOCK."
01100 PRINT "I WILL THEN PRINT WHAT GNP RESULTS FROM YOUR DECISION."
01110 PRINT
01120 PRINT "WOULD YOU LIKE TO SEE THE SPECIAL COMMANDS THAT ARE AVALIBLE?"
01130 GOSUB 7390
01140 IF R8=2 THEN 1220
01150 PRINT ,NEWPAGE
01160 PRINT "THE SPECIAL COMMANDS ARE:"
01170 GOSUB 7580
01180 PRINT "YOU CAN SEE THESE COMMANDS AGAIN DURING THE SIMULATION BY "
01181 PRINT "   TYPING /HELP."
01190 |**********END OF INTRODUCTION, BEGINNING OF STUDENT ROLE AS POLICYMAKER*
01220 GOSUB 2350
01230 FOR J=1 TO 12
01245 PRINT
01250  GOSUB 2190
01260 GOSUB 2210
01280 M$="WHAT LEVEL OF MONEY STOCK DO YOU WANT?"
01290 GOSUB 7000
01300 IF R9=4 THEN 500
01310 IF R9=8 THEN 1240
01320 IF V9>0 THEN 1330
01325 PRINT "YOUR DECISION WILL RESULT IN A NONPOSITIVE GNP WHICH I CANNOT "
01326 PRINT " ALLOW. PLEASE TRY AGAIN WITH A POSITIVE NUMBER."
01327 GOTO 1280
01330 N(J+1)=V9
01340 PRINT "YEAR     MONEY     VELOCITY     YOUR SIMULATED GNP"
01350 IF N(J+1)<N(J) THEN 1380
01360 W(J+1)=W(J)
01370 GOTO 1390
01380 W(J+1)=W(J)-V3
01390 Y(J+1)=N(J+1)*W(J+1)
01400 PRINT USING 1410: Y7,N(J+1),W(J+1),Y(J+1)
01405 IF A7=1 THEN 1850
01410 IMAGE:####   ####.#       #.##              ####.##
01415 |   ARE  COMPUTED AND ADDITIONAL COMMENTS MAY BE ADDED.
01430 P1=100*P(J)*1.03^J
01440 Y9=Y(J+1)-Y(J)
01450 IF Y9>0 THEN 1480
01460 I4=.3*(Y(J+1)-P1)/P1
01470 GOTO 1490
01480 I4=.35*(Y(J+1)-P1)/P1+.25*Y9/Y(J)
01490 P(J+1)=P(J)+I4*P(J)
01500 U=INT(55*(P1-Y(J+1))/P1+2.5)
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01510 I4=INT(100*I4)
01520 IF I4<5 THEN 1620
01530 PRINT "THE RATE OF INFLATION YOU CAUSED WAS ";I4;"PERCENT."
01540 IF I4<9 THEN 1610
01550 PRINT "WALL-STREET BANKERS BELIEVE THAT THE COUNTRY WOULD BENEFIT BY YOUR"
01560 PRINT "RESIGNATION."
01570 IF I4<13 THEN 1610
01580 PRINT "CONGRESS HAS PASSED A RESOLUTION CONDEMNING YOUR POLICIES"
01590 IF I4<24 THEN 1610
01600 PRINT "AND IRATE HOUSE WIVES ARE LOOTING GROCERY STORES."
01610 G1=G1-I4
01620 IF U<4.5 THEN 1690
01630 PRINT "THE LEVEL OF UNEMPLOYMENT WAS ";U;"PERCENT."
01640 IF U<7 THEN 1680
01650 PRINT " A GOOD POLICYMAKER WOULD NOT CAUSE THIS EXCESSIVE UNEMPLOYMENT."
01660 IF U<15 THEN 1680
01670 PRINT "REMEMBER, YOUR GOAL WAS TO STOP THE GREAT DEPRESSION!!"
01680 G1=G1-U
01690 IF ABS(Y(J+1)-P1)/P1>.03 THEN 1720
01700 PRINT "OVERALL YOU DID A GOOD JOB THIS PAST YEAR."
01710 GOTO 1850
01720 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01721 PRINT ,NEWPAGE
01722 IF P(J+1)<1.4 THEN 1780
01730 IF I4<10 THEN 1780
01740 P9=INT((P(J+1)-1)*100)
01750 PRINT "THE PRESIDENT HAS SENT YOU A LETTER REQUESTING YOUR RESIGNATION."
01760 PRINT "HE POINTED OUT THAT PRICES HAVE RISEN BY";P9;"PERCENT SINCE"
01770 PRINT "YOU BECAME THE MONETARY POLICYMAKER."
01780 IF P(J+1)<1.5 THEN 1850
01790 IF P8=1 THEN 1850
01800 PRINT "YOUR POLICIES HAVE CAUSED THE COLLAPSE OF THE INTERNATIONAL"
01810 PRINT "GOLD STANDARD. THE HIGH LEVELOF PRICES IN THE U.S. CAUSED"
01820 PRINT "AMERICANS TO BUY FOREIGN PRODRUCTS. THE FOREIGNERS REDEEMED THEIR"
01830 PRINT "DOLLARS FOR GOLD UNTIL THE TREASURY RAN OUT."
01840 P8=1
01850 NEXT J
01855 IF A7=1 THEN 7550
01860 ! START OF LAST SECTION WHICH GIVES A FINAL COMMENT DEPENDING ON
01861 !***PERFORMANCE **************************************************
01870 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01871 PRINT ,NEWPAGE
01880 PRINT "YOUR TERM AS POLICY MAKER IS NOW ENDED. OVERALL YOUR PERFORMANCE SH
01890 IF G1<94 THEN 1930
01900 PRINT "AN EXCELLENT UNDERSTANDING OF THE SIMPLE QUANTITY THEORY USED IN "
01910 PRINT "THIS SIMULATION. KEEP UP THE GOOD WORK!"
01920 GOTO 7550
01930 IF G1<70 THEN 1970
01940 PRINT "A GOOD UNDERSTANDING OF THIS MODEL, THOUGH PERHAPS IT COULD BE "
01950 PRINT "IMPROVED. KEEP UP THE GOOD WORK!"
01960 GOTO 7550
01970 IF G1<0 THEN 2010
01980 PRINT "THAT YOUR UNDERSTANDING OG THE MODEL USED IN THIS SIMULATION "
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01990 PRINT "BORDERS ON THE INADEQUATE. YOU NEED TO STUDY IT MORE."
02000 GOTO 2020
02010 PRINT "THAT YOU DO NOT KNOW WHAT YOU ARE DOING. BETTER HIT THOSE BOOKS!!"
02020 PRINT "WOULD YOU LIKE AN EXPLANATION OF A STRATEGY THAT WILL HELP YOUR "
02030 PRINT "PERFORMANCE?"
02040 GOSUB 7390
02050 IF R8=2 THEN 2150
02060 PRINT "YOU WANTED GNP TO INCREASE BY ABOUT THREE PER CENT A YEAR STARTING"
02070 PRINT "FROM 1929, THE LAST YEAR OF PROSPERITY. SINCE VELOCITY IS A "
02080 PRINT "CONSTANT UNLESS MONEY STOCK FALLS, YOU MUST INCREASE THE MONEY"
02090 PRINT "STOCK BY THREE PER CENT A YEAR EACH YEAR AFTER 1929. IN 1929 USE"
02100 PRINT "THE HISTORICAL MONEY STOCK."
02101 PRINT "  IN 1930 YOU WANT TO BE THREE PER CENT HIGHER, OR ABOUT "
02110 IF V3<.15 THEN 2160
02120 PRINT "27.1 (26.4 * 1.03). IN 1931 YOU WANT MONEY TO BE THREE PER CENT "
02130 PRINT "HIGHER THAN IN 1930, OR 27.1 * 1.03, ABOUT 27.9, AND SO ON."
02140 PRINT "TRY IT AND SEE WHAT HAPPENS."
02150 GOTO 7550
02160 PRINT "48.0 (46.6 * 1.03). IN 1931 YOU WANT MONEY TO BE THREE PER CENT"
02170 PRINT "HIGHER THAT IN 1930. OR 48 * 1.03, ABOUT 49.4, AND SO ON."
02180 GOTO 2140
02190 PRINT "YEAR     MONEY          VELOCITY     SIMULATED GNP    HISTORICAL GNP"
02200 RETURN
02210 IF W6=1 THEN 2250
02220 M7=M(J)
02230 M8=M(J+1)
02240 GOTO 2270
02250 M7=F(J)
02260 M8=F(J+1)
02270 IF M8>M7 THEN 2300
02280 V(J+1)=V(J)-V3
02290 GOTO 2310
02300 V(J+1)=V(J)
02310 Y4=M8*V(J+1)
02320 Y7=1928+J
02325 !******** FORMATED OUTPUT**************
02330 PRINT USING 2335: Y7,M8,V(J+1),Y4,H(J)
02335 IMAGE:####    ####.#          #.##          ####.#          ####.##
02340 RETURN
02350 IF W6=1 THEN 2400
02360 V(1)=3.9
02370 W(1)=3.9
02380 V3=.25
02390 GOTO 2430
02400 V(1)=2.3
02410 W(1)=2.3
02420 V3=.12
02430 RETURN
07000 PRINT M$
07010 INPUT R$
07020 GOSUB 9108
07030 IF R9<3 THEN 7370
07040 GOSUB 9844
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


07050 IF R$(1:2)="/S" THEN 7550
07070 IF R$(1:2)="/H" THEN 7160
07100 IF R$(1:2)="/B" THEN 7180
07110 IF R$(1:2)="/R" THEN 7312
07130 PRINT "I DO NOT UNDERSTAND YOUR ANSWER.DO YOU NEED HELP?"
07140 GOSUB 7390
07150 IF R8=2 THEN 7000
07160 GOSUB 7560
07170 GOTO 7000
07180 IF F6=1 THEN 7260
07190 F6=F6+1
07200 IF J>1 THEN 7230
07210 J=1
07220 GOTO 7240
07230 J=J-1
07240 R9=8
07250 GOTO 7370
07260 PRINT "YOU HAVE USED THIS COMMAND ONCE. I WILL NOT LET YOU USE IT AGAIN"
07270 PRINT "BECAUSE I WANT YOU TO BE CAREFUL AND AVOID GUESSING. HOWEVER I"
07280 PRINT "WILL LET YOU RESTART THE ENTIRE SIMULATION."
07290 PRINT "WOULD YOU LIKE TO START OVER?"
07300 GOSUB 7390
07310 IF R8=2 THEN 7000
07312 R9=4
07314 IF W6=1 THEN 7323
07315 PRINT "WOULD YOU LIKE TO CONTINUE USING M-1 AS THE MONEY STOCK?"
07317 GOSUB 7390
07318 IF R8=2 THEN 7326
07320 GOTO 7370
07323 PRINT "WOULD YOU LIKE TO CONTINUE USING M-2 AS THE MONEY STOCK?"
07324 GOSUB 7390
07325 IF R8=2 THEN 7328
07326 W6=1
07327 GOTO 7370
07328 W6=0
07370 RETURN
07380 ! SUBPROGRAM BELLOW CHECKS FOR YES OR NO ANSWERS
07390 INPUT R$
07400 GOSUB 9844
07410 IF R$(1:2)="/S" THEN 7550
07430 IF R$(1:1)="N" THEN 7520
07450 IF R$(1:1)="Y" THEN 7500
07470 PRINT "I DID NOT UNDERSTAND YOUR ANSWER. I ASSUME YOU MEANT TO ANSWER YES
07480 R8=3
07490 GOTO 7540
07500 R8=1
07510 GOTO 7540
07520 R8=2
07530 ! FLAG R8 IS 1 FOR Y, 2 FOR NO, 3 FOR OTHER
07540 RETURN
07550 STOP
07560 PRINT "I WOULD LIKE YOU TO EITHER ENTER A NUMBER OR ONE OF THESE SPECIAL"
07570 PRINT "COMMANDS:"
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP

07580 PRINT "        /STOP OR /S -- TAKES YOU TO END OF PROGRAM."
07590 PRINT "        /RESTART OR /R -- TAKES YOU TO BEGINNING OF PROGRAM."
07600 PRINT "        /BACK OR /B -- LETS YOU REPEAT A YEAR. (YOU MAY ONLY USE)"
07610 PRINT "                       THIS COMMAND TWICE BECAUSE I WANT TO "
07620 PRINT "                       DISCOURAGE GUESSING AND CARELESSNESS.)"
07630 RETURN
09108 A$="0123456789.+-"
09110 P5=1
09111 ! POSITIVE / NEGATIVE INDICATOR
09112 D5=0
09113 ! DECIMAL YET? INDICATOR
09114 D6=0
09115 ! DECIMAL COUNTER
09116 V9=0
09118 R5=0
09119 ! VALUE YET? INDICATOR
09120 R9=0
09126 FOR H4=F9 TO LEN(R$)
09128 J5=0
09130 J5=J5+1
09132 IF R$(H4:H4)=A$(J5:J5) THEN 9140
09134 IF J5=13 THEN 9200
09136 GOTO 9130.
09140 J5=J5-1
09142 IF J5<10 THEN 9170
09144 IF J5>10 THEN 9190
09145 ! HAVE FOUND A DECIMAL
09146 IF D5=1 THEN 9200
09148 D5=1
09150 GOTO 9240
09170 IF D5=1 THEN 9180
09172 V9=V9*10+J5
09173 R5=1
09174 IF V9<9.30 THEN 9240
09176 R9=3
09178 GOTO 9280
09180 D6=D6+1
09181 IF D6<6 THEN 9185
09182 R9=3
09183 GOTO 9280
09185 V9=V9+J5/(10^D6)
09186 R5=1
09187 GOTO 9240
09190 IF H4>1 THEN 9200
09192 IF J5=11 THEN 9240
09194 P5=-1
09196 GOTO 9240
09200 IF R5=0 THEN 9220
09202 R9=1
09203 ! R9=1 MEANS INCOMPLETE NUMBER
09204 GOTO 9280
09220 R9=4
09221 ! MEANS INVALID NUMBER
```

```
PROGRAM NAME: ECM2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


09222 GOTO 9300
09240 NEXT H4
09280 V9=V9*P5
09300 RETURN
09844 LET A$="ABCDEFGHIJKLM"
09845 LET C$="NOPQRSTUVWXYZ"
09846 B$="ABCDEFGHIJKLM"
09847 D$="NOPQRSTUVWXYZ"
09848 T$=" "
09849 J5=1
09850 FOR H4=1 TO LEN(R$)
09852 IF R$(H4:H4)=" " THEN 9860
09854 T$(J5:J5)=R$(H4:H4)
09856 J5=J5+1
09860 NEXT H4
09862 ! OUTPUT IN T HAS BLANKS REMOVED. NOW TO UPSHIFT
09866 FOR H4=1 TO LEN(T$)
09868 FOR J5=1 TO 13
09870 IF T$(H4:H4)=B$(J5:J5) THEN 9876
09871 IF T$(H4:H4)=D$(J5:J5) THEN 9874
09872 NEXT J5
09873 GOTO 9878
09874 T$(H4:H4)=C$(J5:J5)
09875 GOTO 9878
09876 T$(H4:H4)=A$(J5:J5)
09878 NEXT H4
09880 R$=T$
09998 RETURN
09999 END
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LIST

00001 ! LESSON WRITTEN BY DR. ROBERT SCHENK IN 1977. LATEST REVISION JAN 1981
00002 ! PARTIAL SUPPORT GIVEN BY THE NATIONAL SCIENCE FOUNDATION UNDER GRANT
00003 ! SER78-00065
00010 DIM R$*72,I$*72,A$*13,B$*13,C$*13,D$*14
00020 F9=1
00090 PRINT ,NEWPAGE
00100 PRINT "THIS LESSON EXAMINE THE WORKINGS OF A VERY SIMPLE KEYNESIAN MODEL."
00105 PRINT "BEFORE YOU BEGIN THIS LESSON YOU SHOULD HAVE SOME FAMILIARITY WITH"
00110 PRINT "NOTIONS SUCH AS THE MULTIPLIER, THE MARGINAL PROPENSITY TO SAVE AND"
00115 PRINT "CONSUME, AND KEYNESIAN EQUILIBRIUM."
00130 PRINT "IF YOU WANT TO REPEAT A SECTION OR SKIP SECTIONS, YOU CAN SHIFT TO"
00140 PRINT "WHICHEVER OF THE 14 SECTIONS YOU WANT BY TYPING IN /BACK WHEN I ASK"
00150 PRINT "FOR A RESPONSE (EXCEPT FOR THE 'PRESS C AND ENTER TO CONTINUE' RES-"
00160 PRINT "PONSE). TO STOP AT ANY POINT, TYPE IN /STOP. IF YOU HAVE NO IDEA OF"
00170 PRINT "WHAT THE CORRECT ANSWER IS, GUESS AND THE COMPUTER WILL EXPLAIN WHY"
00171 PRINT "ANSWER IS WRONG."
00180 INPUT "ARE YOU READY TO BEGIN? (TYPE YES WHEN YOU ARE READY AND HIT ENTER)":
00200 PRINT ,NEWPAGE
00203 PRINT "#1"
00204 A=0
00205 PRINT "SUPPOSE WE HAVE AN ECONOMY THAT RUNS ACCORDING TO THIS KEYNESIAN MOD
00215 GOSUB 5000
00220 PRINT "WHAT IS THE EQUILIBRIUM LEVEL OF INCOME?"
00225 GOSUB 7000
00226 A=A+1
00227 IF R9<>2 THEN 230
00228 GOSUB 5000
00229 GOTO 220
00230 IF V9=240 THEN 280
00235 IF A>1 THEN 270
00240 PRINT "INCORRECT. TO BE IN EQUILIBRIUM, THE AMOUNTS THAT PEOPLE WANT TO"
00245 PRINT "CONSUME, BUSINESS WANTS TO INVEST, AND THE GOVERNMENT WANTS TO SPEND
00250 PRINT "MUST EQUAL INCOME. ANOTHER WAY OF LOOKING AT THIS IS BY FINDING THE"
00255 PRINT "LEVEL OF INCOME AT WHICH LEAKAGES FROM THE FLOW OF SPENDING -- SAVIN
00258 PRINT "AND TAXES -- EQUAL INJECTIONS INTO THE FLOW OF SPENDING -- INVESTME
00260 PRINT "AND GOVERNMENT SPENDING. TRY AGAIN."
00265 GOTO 220
00270 PRINT "THE CORRECT ANSWER WAS 240."
00275 GOTO 405
00280 PRINT "CORRECT."
00400 ! START OF SECTION 2==========MPI :::::==========2
00405 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00406 PRINT ,NEWPAGE
00407 PRINT "#2"
00410 A=0
00425 PRINT "WHAT IS THE MARGINAL PROPENSITY TO INVEST IN THE ABOVE TABLE?"
00430 GOSUB 7000
00435 A=A+1
00436 IF R9<>2 THEN 440
00437 GOSUB 5000
00438 GOTO 425
00440 IF V9=0 THEN 580
00445 IF A=3 THEN 570
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


00450 IF V9<>.25 THEN 470
00455 PRINT "INCORRECT. WE WANT THE MARGINAL PROPENSITY TO INVEST, NOT THE"
00460 PRINT "MARGINAL PROPENSITY TO SAVE. TRY AGAIN."
00465 GOTO 425
00470 IF V9<>.75 THEN 490
00475 PRINT "INCORRECT. YOU HAVE FOUND THE MARGINAL PROPENSITY TO CONSUME."
00477 PRINT " TRY AGAIN."
00480 GOTO 425
00490 IF V9<>4 THEN 515
00495 PRINT "INCORRECT. YOU HAVE FOUND THE MULTIPLIER, BUT WE ARE LOOKING FOR"
00500 PRINT "THE MARGINAL PROPENSITY TO INVEST. TRY AGAIN."
00505 GOTO 425
00515 PRINT "YOUR ANSWER OF ";V9;"IS INCORRECT."
00520 PRINT "TO FIND THE MARGINAL PROPENSITY TO INVEST, ASK YOURSELF BY HOW MUCH"
00525 PRINT "DOES INVESTMENT INCREASE WHEN INCOME INCREASES. TRY AGAIN."
00530 GOTO 425
00570 PRINT "THE CORRECT ANSWER IS 0. CHANGES IN INCOME HAVE NO EFFECT IN THIS"
00572 PRINT "MODEL ON THE AMOUNT THAT BUSINESS WANTS TO INVEST."
00575 GOTO 1605
00580 PRINT "CORRECT."
00600 !START OF SECTION 3 ************************************************************
00605 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00606 PRINT ,NEWPAGE
00607 PRINT "#3"
00610 A=0
00620 PRINT "YOU WILL NEED THE TABLE FREQUENTLY THROUGOUT THIS EXERCISE. TO"
00621 PRINT "SEE IT AGAIN, TYPE IN /HELP WHEN I ASK A QUESTION."
00623 PRINT
00625 PRINT "WHAT IS THE MARGINAL PROPENSITY TO SAVE IN THE ABOVE TABLE?"
00630 GOSUB 7000
00631 IF R9<>2 THEN 635
00632 GOSUB 5000
00633 GOTO 625
00635 IF V9=.25 THEN 780
00640  A=A+1
00645 IF A=3 THEN 770
00650 IF V9<>.75 THEN 750
00660 PRINT "INCORRECT. YOU HAVE FOUND THE MARGINAL PROPENSITY TO CONSUME. "
00665 PRINT " TRY AGAIN."
00670 GOTO 625
00750 PRINT "YOUR ANSWER OF ";V9;" IS INCORRECT."
00755 PRINT "ASK YOURSELF BY HOW MUCH DOES SAVINGS INCREASE WHEN INCOME GOES"
00756 PRINT "UP BY 40. (YOUR ANSWER SHOULD BE IN DECIMAL FORM.)"
00760 GOTO 625
00770 PRINT "THE CORRECT ANSWER WAS 0.25. THE MARGINAL PROPENSITY TO SAVE IS"
00772 PRINT "FOUND BY DIVIDING THE CHANGE IN SAVING BY THE CHANGE IN INCOME."
00774 PRINT "EACH TIME INCOME GOES UP BY 40, SAVING GOES UP BY 10. 10 DIVIDED"
00776 PRINT "BY 40 EQUALS 0.25"
00778 GOTO 810
00780 PRINT "CORRECT."
00800 ! START OF SECTION  4  ************************************************************
00810 INPUT "PRESS C AND ENTER  TO CONTINUE": CONT$
00812 PRINT ,NEWPAGE
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


00814 PRINT "#4"
00815 A=0
00825 PRINT "WHEN INCOME IS 240, WHAT IS THE AVERAGE PROPENSITY TO CONSUME?"
00830 GOSUB 7000
00831 IF R9<>2 THEN 835
00832 GOSUB 5000
00833 GOTO 825
00835 A=A+1
00840 IF V9<.87 THEN 870
00845 IF V9>.88 THEN 870
00850 PRINT "CORRECT."
00855 GOTO 1010
00870 IF A=3 THEN 980
00880 IF V9<>.75 THEN 950
00890 PRINT "YOU ARE SUPPOSED TO FIND THE AVERAGE PROPENSITY CONSUME, NOT THE"
00895 PRINT "MARGINAL PROPENSITY. TRY AGAIN."
00900 GOTO 825
00950 PRINT "YOUR ANSWER OF";V9;"IS INCORRECT. AVERAGE ALWAYS MEANS THERE IS A"
00960 PRINT "DIVISION INVOLVED. TRY AGAIN."
00965 GOTO 825
00980 PRINT "THE CORRECT ANSWER IS .875. THIS IS FOUND BY DIVIDING 210 BY 240."
01000 ! START OF SECTION 5 ************************************************
01010 A=0
01012 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01014 PRINT ,NEWPAGE
01015 PRINT "#5"
01025 PRINT "FOR EQUILIBRIUM INCOME TO INCREASE BY 40, BY HOW MUCH MUST "
01030 PRINT "GOVERNMENT SPENDING INCREASE?"
01035 GOSUB 7000
01036 IF R9<>2 THEN 1040
01037 GOSUB 5000
01038 GOTO 1025
01040 A=A+1
01045 IF V9=10 THEN 1180
01050 IF A=2 THEN 1150
01060 IF V9<>40 THEN 1100
01065 PRINT "INCORRECT. IF YOU ADD UP C, I, AND G AT 280, YOU WILL FIND THAT"
01070 PRINT "THEY TOTAL 310. SINCE PEOPLE WANT TO SPEND MORE THAN THEY RECEIVE,"
01075 PRINT "THIS IS NOT EQUILIBPIUM. YOU FORGOT THAT WHEN THE GOVERNMENT "
01080 PRINT "INCREASES ITS SPENDING, THE CONSUMERS ALSO INCREASE THEIR TAXES."
01081 PRINT "  TRY AGAIN. "
01095  GOTO 1025
01100 PRINT "INCORRECT. WE WANT TO GET TO 280 FROM 240. DECIDE WHAT NUMBER WE"
01110 PRINT "SHOULD PUT INTO THE LAST COLUMN TO GIVE US AN EQUILIBRIUM OF 280."
01115 PRINT " TRY AGAIN."
01120 GOTO 1025
01150 PRINT " THE CORRECT ANSWER IS 10. IF THE GOVERNMENT SPENDS 10, THE TOTAL"
01160 PRINT "INJECTIONS INTO THE FLOW OF SPENDING WHEN INCOME IS 280 ARE 40 "
01162 PRINT "(30 FROM INVESTMENT, 10 FROM GOVERNMENT SPENDING), AND THIS JUST"
01163 PRINT "EQUALS THE LEAKAGE OF 40 IN THE FORM OF SAVINGS."
01165 GOTO 1210
01180 PRINT "CORRECT."
01200 !  START OF SECTION 6 ************************************************
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01210 A=0
01212 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01214 PRINT ,NEWPAGE
01225 PRINT "#6"
01226 PRINT "WHAT IS THE MULTIPLIER IN THIS MODEL?"
01230 GOSUB 7000
01231 IF R9<>2 THEN 1235
01232 GOSUB 5000
01233 GOTO 1225
01235 IF V9=4 THEN 1350
01240 A=A+1
01245 IF A=2 THEN 1350
01250 PRINT "INCORRECT. IN THE LAST SECTION WE FOUND THAT IF GOVERNMENT SPENDING
01255 PRINT "INCREASED BY 10, INCOME INCREASED BY 40. EACH ADDITIONAL DOLLAR OF"
01260 PRINT "GOVERNMENT SPENDING INCREASES EQUILIBRIUM INCOME BY HOW MUCH?"
01270 GOTO 1225
01350 PRINT "CORRECT."
01360 GOTO 1405
01390 PRINT "THE CORRECT ANSWER IS FOUR."
01400 ! START OF SECTION 7 ************************************************
01405 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01407 PRINT ,NEWPAGE
01409 PRINT "#7"
01410 A=0
01420 PRINT "NOW I AM GOING TO GIVE YOU A MORE COMPLICATED TABLE"
01430 GOSUB 5061
01435 PRINT "WHAT NUMBER SHOULD REPLACE '--A--'?"
01440 GOSUB 7000
01441 A=A+1
01445 IF R9<>2 THEN 1450
01446 GOSUB 5061
01447 GOTO 1435
01450 IF V9=16 THEN 1550
01455 IF A>1 THEN 1590
01460 PRINT "THRERE ARE THREE THINGS PEOPLE MAY DO WITH THEIR INCOMES: THEY CAN
01465 PRINT "SAVE, SPEND, OR GIVE IT TO THE GOVERNMENT. C + S + T MUST EQUAL INC
01470 PRINT "YOUR ANSWER IS INCORRECT. TRY AGAIN."
01475 GOTO 1435
01550 PRINT "CORRECT."
01555 GOTO 1605
01590 PRINT "THE CORRECT ANSWER WAS 16."
01600 ! START OF SECTION 8 ************************************************
01605 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01607 PRINT ,NEWPAGE
01609 PRINT "#8"
01610 A=0
01620 PRINT "WHAT NUMBER SHOULD REPLACE '--B--'?"
01625 GOSUB 7000
01630 IF R9<>2 THEN 1640
01632 GOSUB 5061
01635 GOTO 1620
01640 IF V9=252 THEN 1700
01645 A=A+1
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01650 IF A>1 THEN 1750
01660 PRINT "INCORRECT. REMEMBER, INCOME IS TOTALLY USED UP BY TAXES, SPENDING,"
01665 PRINT "OR SAVING. TRY AGAIN."
01670 GOTO 1620
01700 PRINT "CORRECT."
01710 GOTO 1810
01750 PRINT "INCORRECT. THE CORRECT ANSWER IS 252."
01800 ! START OF SECTION 9 ==========================================
01810 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01812 PRINT ,NEWPAGE
01815 PRINT "#9"
01820 PRINT "WHAT NUMBER SHOULD REPLACE '--C--'?"
01825 GOSUB 7000
01830 IF R9<>2 THEN 1840
01835 GOSUB ,5061
01837 GOTO 1820
01840 IF V9=45 THEN 1900
01850 PRINT "INCORRECT. THE CORRECT ANSWER WAS 45. REMEMBER THAT TOTAL INCOME "
01860 PRINT "MUST BE SPENT ON CONSUMPTION, PAYED AS TAXES, OR SAVED. THERE IS"
01865 PRINT "NO FOURTH OPTION."
01870 GOTO 2010
01900 PRINT "CORRECT."
02000 ! START SECTION 10 ============================================
02010 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
02012 PRINT ,NEWPAGE
02015 PRINT "#10"
02020 A=0
02025 PRINT "WHAT IS THE EQUILIBRIUM LEVEL OF INCOME IN THIS TABLE? (TO SEE THE
02030 PRINT "TABLE AGAIN, TYPE IN /HELP. THIS WILL ALSO WORK FOR THE REMAINDER"
02035 PRINT "OF THE QUESTIONS.)"
02040 GOSUB 7000
02045 IF R9<>2 THEN 2060
02050 GOSUB 5065
02055 PRINT "WHAT IS THE EQUILIBRIUM LEVEL OF INCOME?"
02056 GOTO 2040
02060 IF V9=190 THEN 2150
02063 LET A=A+1
02065 IF A>1 THEN 2100
02070 PRINT "INCORRECT. TO BE IN EQUILIBRIUM, DESIRED SPENDING (CONSUMPTION,"
02075 PRINT "INVESTMENT, AND GOVERNMENT SPENDING) MUST TOTAL INCOME."
02080 PRINT "TRY AGAIN."
02090 GOTO 2025
02100 PRINT "THE CORRECT ANSWER IS 190. HERE 162 + 8 + 20 = 190, OR C + I + G =Y
02120 GOTO 2205
02150 PRINT "CORRECT."
02200 ! START OF SECTION 11 ==========================================
02205 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
02207 PRINT ,NEWPAGE
02209 PRINT "#11"
02210 A=0
02225 PRINT "WHAT IS THE MARGINAL PROPENSITY TO INVEST IN THE ABOVE TABLE?"
02230 GOSUB 7000
02235 IF R9<>2 THEN 2250
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


02240 GOSUB 5065
02245 GOTO 2225
02250 IF V9=.2 THEN 2300
02255 A=A+1
02260 IF A>2 THEN 2350
02264 IF V9<>0 THEN 2270
02266 PRINT "INCORRECT. THAT WAS THE ANSWER FROM THE OLD TABLE. YOU SHOULD BE "
02268 PRINT "USING THE NEW TABLE."
02269 GOTO 2225
02270 PRINT "YOUR ANSWER OF ";V9;" IS INCORRECT."
02275 PRINT "TO FIND THE MARGINAL PROPENSITY TO INVEST, ASK BY HOW MUCH "
02278 PRINT "INVESTMENT INCREASES WHEN INCOME INCREASES. TRY AGAIN."
02280 GOTO 2225
02300 PRINT "CORRECT."
02310 GOTO 2405
02350 PRINT "THE CORRECT ANSWER IS .2. EACH TIME INCOME GOES UP BY 60, "
02355 PRINT "INVESTMENT INCREASES BY 12. 12/60 = 1/5 = .2"
02400 ! START OF SECTION 12 ***********************************************
02405 A=0
02407 INPUT "PRESS C AND ENTER TO CONTINUE.": CONT$
02409 PRINT ,NEWPAGE
02410 PRINT "#12"
02425 PRINT "WHAT IS THE MARGINAL PROPENSITY TO SAVE IN THE ABOVE TABLE?"
02430 GOSUB 7000
02435 IF R9<>2 THEN 2450
02440 GOSUB 5065
02445 GOTO 2425
02450 IF V9<.16 THEN 2500
02455 IF V9>.17 THEN 2500
02460 PRINT "CORRECT."
02470 GOTO 2605
02500 A=A+1
02510 IF A<2 THEN 2580
02515 IF V9<>.15 THEN 2530
02520 PRINT "YOUR ANSWER IS ALMOST CORRECT. HOWEVER, MARGINAL PROPENSITY TO"
02522 PRINT "SAVE IS USUALLY COMPUTED ON THE BASIS OF DISPOSABLE INCOME "
02524 PRINT "(INCOME AFTER TAXES). YOU ARE COMPUTING IT ON THE BASIS OF TOTAL"
02526 PRINT "INCOME. PLEASE TRY AGAIN."
02528 GOTO 2425
02530 PRINT "YOUR ANSWER OF ";V9;"IS NOT CORRECT."
02532 PRINT "THE MMARGINAL PROPENSITY TO SAVE TELLS US THE PERCENTAGE OF AFTER-"
02534 PRINT "TAX INCOME THAT IS SAVED. LOOK AT THE TABLE CAREFULLY AND TRY AGAIN"
02536 GOTO 2425
02580 PRINT "THE CORRECT ANSWER IS .167 . THE MARGINAL PROPENSITY TO SAVE IS "
02582 PRINT "FOUND BY COMPUTING WHAT PERCENTAGE OF AFTER TAX INCOME (DISPOSABLE"
02584 PRINT "INCOME) IS SAVED. FROM THE TABLE WE SEE THAT EACH TIME TOTAL INCOME"
02586 PRINT "INCREASES BY 60, DISPOSABLE INCOME GOES UP BY 54 (BECAUSE TAXES GO"
02588 PRINT "UP BY 9). OF THAT 54, 9 IS SAVED, SO THE MPS IS 9/54 OR .167 ."
02600 ! START OF SECTION 13 ***********************************************
02605 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
02607 PRINT ,NEWPAGE
02609 PRINT "#13"
02610 A=0
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


02625 PRINT "FOR EQUILIBRIUM INCOME TO INCREASE BY 60, BY HOW MUCH MUST "
02630 PRINT "GOVERNMENT SPENDING INCREASE?"
02640 GOSUB 7000
02645 IF R9<>2 THEN 2660
02650 GOSUB 5065
02655 GOTO 2625
02660 IF V9<>3 THEN 2680
02665 PRINT "CORRECT."
02670 GOTO 2810
02680 A=A+1
02685 IF A>2 THEN 2775
02690 IF V9>12 THEN 2730
02695 IF V9<9 THEN 2730
02700 PRINT "YOU MUST BE TRYING TO FIND THE MULTIPLIER BY USING THE FORMULA"
02705 PRINT "1/MPS. IT DOES NOT WORK IN THIS MODEL, BECAUSE INVESTMENT AND"
02710 PRINT "TAXES ALSO MOVE WITH INCOME. LOOK AT THE TABLE CAREFULLY AND TRY AG
02715 GOTO 2625
02730 PRINT "YOUR ANSWER OF ";V9;" IS INCORRECT."
02735 PRINT "EQUILIBRIUM IS NOW AT 190. WE WANT TO GET TO 250. YOU MUST DECIDE"
02740 PRINT "WHAT NUMBER SHOULD BE IN THE LAS COLUMN OF THE TABLE TO MAKE"
02744 PRINT "EQUILIBRIUM RISE TO 250. TRY AGAIN."
02748 GOTO 2625
02775 PRINT "INCORRECT. THE CORRECT ANSWER IS 3. IF THE GOVERNMENT SPENDS"
02778 PRINT "23, THEN TOTAL INJECTIONS INTO THE FLOW OF SPENDING WHEN INCOME IS"
02780 PRINT "250 ARE 43 (20 FROM INVESTMENT AND 23 FROM GOVERNMENT SPENDING),"
02784 PRINT "AND THIS JUST EQUALS THE LEAKAGES OF 43 IN THE FORM OF SAVINGS AND"
02788 PRINT "TAXES."
02800 |START OF SECTION  14 ************************************************
02810 INPUT "PRESS C AND ENTER  TO CONTINUE.": CONT$
02812 PRINT NEWPAGE
02814 PRINT "#14 LAST SECTION"
02815 A=0
02825 PRINT "WHAT IS THE MULTIPLIER IN THI MODEL?"
02830 GOSUB 7000
02835 IF R9<>2 THEN 2850
02840 GOSUB 5065
02845 GOTO 2825
02850 IF V9=20 THEN 2900
02855 A=A+1
02860 IF A>1 THEN 2950
02865 PRINT "INCORRECT. IN THE LAST SECTION WE FOUND THAT IF GOVERNMENT SPENDING
02870 PRINT "INCREASED BY 3, INCOME INCREASED BY 60. EACH ADDITIONAL DOLLAR OF"
02875 PRINT "GOVERNMENT SPENDING INCREASES EQUILIBRIUM INCOME BY HOW MUCH?"
02880 PRINT "TRY AGAIN."
02885 GOTO 2825
02900 PRINT "CORRECT."
02910 GOTO 2960
02950 PRINT "INCORRECT. THE CORRECT ANSWER WAS 20."
02960 PRINT
02962 PRINT "                                ***********"
02964 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
02965 PRINT NEWPAGE
02970 PRINT "IN THIS LESSON YOU REVIEWED:"
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


02980 PRINT "     A) CONDITIONS FOR EQUILIBRIUM IN A SIMPLE INCOME-EXPEN-"
02985 PRINT "              DITURE MODEL;"
02990 PRINT "     B) AVERAGE AND MARGINAL PROPENSITIES;"
02995 PRINT "     C) THE IDENTITY: INCOME + C + S + T; AND"
03000 PRINT "     D) HOW A CHANGE IN AUTONOMOUS SPENDING (G OR I) CAUSES A"
03005 PRINT "        MULTIPLE CHANGE IN EQUILIBRIUM INCOME."
03040 STOP
05000 GOSUB 5210
05010 PRINT "  160          150      10        0              30          0"
05020  PRINT "  200          180      20         0             30          0"
05030 PRINT "  240          210      30        0              30          0"
05040 PRINT "  280          240      40        0              30          0"
05060 RETURN
05061 A$="--A--"
05062 B$="--B--"
05063 C$="--C--"
05064 GOTO 5070
05065 A$="  16 "
05066 B$=" 252 "
05067 C$="  45 "                    162
05070 GOSUB 5210
05080 PRINT "  190          182      18        10             8          20"
05090 PRINT "  230          207      27      ";A$;"           20          20"
05100 PRINT "  310        ";B$;"      36        22            32          20"
05110 PRINT "  370          297    ";C$;"      28             44          20"
05120 PRINT "  430          342      54        34             56          20"
05130 RETURN
05210 PRINT "IF INCOME              PEOPLE WILL:              BUSINESS     GOVERNMENT"
05220 PRINT "IS:                                  PAY AS     INTENDS       WILL"
05230 PRINT "                  CONSUME  SAVE      TAXES      TO INVEST     SPEND"
05240 PRINT "                                                               "
05250 RETURN
06999 PRINT "PLEASE ENTER A NUMBER."
07000 INPUT R$
07001 ! SUBROUTINE ENTERS A NUMBER, CHECKS FOR SPECIAL COMMANDS, RETURNS NUMBER
07019 ! GOSUB VALUE
07020 GOSUB 9108
07030 IF R9<4 THEN 7310
07040 GOSUB 9844
07045 IF R$(1:2)="/B" THEN 7900
07050 IF R$(1:2)="/S" THEN 3040
07051 R9=R9+1
07057 IF R$(1:2)="/H" THEN 7125
07060 PRINT "I DO NOT UNDERSTAND YOUR ANSWER. DO YOU NEED HELP?"
07065 INPUT R$
07066 GOSUB 9844
07070 IF R$(1:1)="N" THEN 6999
07080 PRINT "       IF YOU NEED TO HAVE A TABLE REPEATED, TYPE IN /HELP WHEN I"
07082 PRINT "       ASK FOR A NUMBER. IF YOU WANT TO REPEAT A SECTION, TYPE IN"
07084 PRINT "       /BACK. TO STOP, TYPE IN /STOP. OTHERWISE, PLEASE ENTER AN"
07086 PRINT "       ANSWER THAT IS A NUMBER."
07090 GOTO 7000
7125 R9=2
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


07310 RETURN
07900 ! /BACK ROUTINE
07910 PRINT "WHICH SECTION DO YOU WANT TO TAKE?"
07920 GOSUB 7000
07930 V9=INT(V9)
07940 IF V9<1 THEN 7970
07950 IF V9>14 THEN 7970
07960 ON V9 GOTO 200,400,600,800,1000,1200,1400,1600,1800,2000,2200,2400,2600,2800
07970 PRINT "THAT IS NOT A LEGAL SECTION. TRY A NUMBER BETWEEN 1 AND 14."
07980 GOTO 7910
09108 A$="0123456789.+-"
09110 P5=1
09111 ! POSITIVE / NEGATIVE INDICATOR
09112 D5=0
09113 ! DECIMAL YET? INDICATOR
09114 D6=0
09115 ! DECIMAL COUNTER
09116 V9=0
09118 R5=0
09119 ! VALUE YET? INDICATOR
09120 R9=0
09126 FOR H4=F9 TO LEN(R$)
09128 J5=0
09130 J5=J5+1
09132 IF R$(H4:H4)=A$(J5:J5) THEN 9140
09134 IF J5=13 THEN 9200
09136 GOTO 9130
09140 J5=J5-1
09142 IF J5<10 THEN 9170
09144 IF J5>10 THEN 9190
09145 ! HAVE FOUND A DECIMAL
09146 IF D5=1 THEN 9200
09148 D5=1
09150 GOTO 9240
09170 IF D5=1 THEN 9180
09172 V9=V9*10+J5
09173 R5=1
09174 IF V9<9^30 THEN 9240
09176 R9=3
09178 GOTO 9280
09180 D6=D6+1
09181 IF D6<6 THEN 9185
09182 R9=3
09183 GOTO 9280
09185 V9=V9+J5/(10^D6)
09186 R5=1
09187 GOTO 9240
09190 IF H4>1 THEN 9200
09192 IF J5=11 THEN 9240
09194 P5=-1
09196 GOTO 9240
09200 IF R5=0 THEN 9220
09202 R9=1
```

```
PROGRAM NAME: ECK1
SYSTEM/34 BASIC -- RELEASE 07
LISTP


09203 ! R9=1 MEANS INCOMPLETE NUMBER
09204 GOTO 9280
09220 R9=4
09221 ! MEANS INVALID NUMBER
09222 GOTO 9300
09240 NEXT H4
09280 V9=V9+P5
09300 RETURN
09844 LET A$="ABCDEFGHIJKLM"
09845 LET C$="NOPQRSTUVWXYZ"
09846 B$="ABCDEFGHIJKLM"
09847 D$="NOPQRSTUVWXYZ"
09848 T$=" "
09849 J5=1
09850 FOR H4=1 TO LEN(R$)
09852 IF R$(H4:H4)=" " THEN 9860
09854 T$(J5:J5)=R$(H4:H4)
09856 J5=J5+1
09860 NEXT H4
09862 ! OUTPUT IN T HAS BLANKS REMOVED. NOW TO UPSHIFT
09866 FOR H4=1 TO LEN(T$)
09868 FOR J5=1 TO 13
09870 IF T$(H4:H4)=B$(J5:J5) THEN 9876
09871 IF T$(H4:H4)=D$(J5:J5) THEN 9874
09872 NEXT J5
09873 GOTO 9878
09874 T$(H4:H4)=C$(J5:J5)
09875 GOTO 9878
09876 T$(H4:H4)=A$(J5:J5)
09878 NEXT H4
09880 R$=T$
09998 RETURN
09999 END
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC --- RELEASE 07
LISTP

00010 ! PROGRAM WRITTEN IN JUNE 1977 WITH NUMEROUS REVISIONS SINCE THEN
00020! AUTHOR IS ROBERT E.SCHENK
00030 !LATEST REVISION JAN 15,1981
00035 !IMPLEMENTED TO THE IBM SYSTEM/34 DEC,1981
00040 !WORK ON THIS MATERIAL WAS PARTIALLY SUPPORTED BY THE NATIONAL SCIENCE
00045 ! FUNDATION UNDER GRANT SER78-00065
00240 DIM R$*72,M$*72,A$*14,D$*14
00245 DIM B$*14,C$*14
00250 DIM T$*72,H(13),Y(13)
00260 DIM I(12),G(12),T(12),P(13)
00265 A7=1
00266 ! PREVIOUS STATEMENTS CONTROLS WHETHER OR NOT COMMENTS ABOUT
00267 ! INFLATION AND UNEMPLOYMENT ARE PRINTED
00270 FOR J=1 TO 12
00280 READ I(J),G(J),T(J),H(J)
00290 NEXT J
00300 DATA 17.3,8.8,9.8,103.4,10.2,9.5,9.2,90.7
00310 DATA 6.1,9.5,6.6,76.1,1.4,8.3,6.5,58.3
00320 DATA 1.8,8.2,6.8,55.8,3.9,10,7.6,65.3
00330 DATA 6.5,10.2,8.2,72.5,8.5,12.2,9.1,82.7
00340 DATA 12.1,12,12.3,90.7,7.7,13.2,11.4,85
00350 DATA 10.3,13.5,11.3,90.8,14.9,14.2,13.5,100
00360 ! SOURCES OF DATA: THE NATIONAL INCOME AND PRODUCT ACCOUNTS OF THE UNITED
00370 ! STATES, 1929-74, STATISTICAL TABLES (DEPT OF ECONOMIC ANALYSIS, U.S.
00380 ! DEPT. OF COMMERCE), PP. 324,339. THIS IS A SUPPLEMENT TO THE SURVEY
00390 ! OF CURRENT BUSINESS. TAXES WERE COMPUTED AS GOVERNMENT EXPENDITURES
00400 ! MINUS SURPLUS OR DEFICIT ON PP. 339.
00440 F9=1
00450 Y(1)=100
00460 G1=100
00470 P(1)=1
00480 A=14
00490 B=2/3
00500 PRINT ,NEWPAGE,"WOULD YOU LIKE AN EXPLANATION OF THIS SIMULATION?"
00510 F6=0
00520 GOSUB 7390
00530 IF R8=2 THEN 1080
00540 PRINT "THIS SIMULATION USES A SIMPLE KEYNESIAN MODEL, SUCH AS CAN BE FOUND
00550 PRINT "IN VIRTUALLY ALL PRINCIPLES-OF -MACROECONOMICS TEXTBOOKS, TO EXPLAI
00560 PRINT "THE GREAT DEPRESION. AS YOU ARE AWARE, IN THE KEYNESIAN MODEL THE"
00570 PRINT "LEVEL OF GNP IS DETERMINED BY THE DEMAND FOR OUTPUT, WHICH IN TURN"
00580 PRINT "IS COMPOSED OF THREE PRIMARY COMPONENTS: CONSUMPTION, INVESTMENT,"
00590 PRINT "AND GOVERNMENT SPENDING. THE GOVERNMENT CAN INFLUENCE THE LEVEL OF"
00600 PRINT "GNP WITH FISCAL POLICY, THAT IS, BY CHANGING THE LEVEL OF GOVERNMEN
00601 PRINT "SPENDING OR BY CHANGING TAXES."
00602 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00603 PRINT ,NEWPAGE
00630 PRINT "HERE IS THE MODEL ON WHICH THIS SIMULATION IS BASED"
00640 PRINT "     GNP = CONSUMPTION + INVESTMENT + GOVERMENT SPENDING"
00650 PRINT "     CONSUMPTION = A + B(GNP - TAXES)"
00660 PRINT "     A = 14.0    B = 2/3"
00670 PRINT "     INVESTMENT TAKES ITS HISTORICAL VALUES"
00680 PRINT "     GOVERNMENT SPENDING IS SET BY THE POLICYMAKER"
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC -- RELEASE 07.
LISTP


00690 PRINT "      TAXES ARE SET BY THE POLICYMAKER"
00700 PRINT "       (INVESTMENT INCLUDES NET EXPORTS.)"
00710 PRINT "DO YOU WANT MORE INFORMATION"
00720 GOSUB 7390
00730 IF R8=2 THEN 1080
00740 PRINT NEWPAGE
00741 PRINT "THE NEXT SCREEN WILL SHOW HOW THIS MODEL PREDICTS USING"
00742 PRINT "HISTORICAL DATA"
00743 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00744 PRINT NEWPAGE
00750 GOSUB 2200
00760 FOR J=1 TO 8
00770 GOSUB 2240
00780 LET Y7=1928+J
00790 IMAGE:####   ###.#   ######.#   #####.#  #####.#   #####.#    #####.#
00800 PRINT USING 790: Y7,I(J),G(J),T(J),C,Y4,H(J)
00805 NEXT J
00807 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
00808 PRINT NEWPAGE
00809 GOSUB 2200
00810 FOR J=9 TO 12
00811 GOSUB 2240
00812 Y7=1928+J
00814 PRINT USING 790: Y7,I(J),G(J),T(J),C,Y4,H(J)
00815 NEXT J
00820 PRINT "HISTORICAL GNP IS WHAT ACTUALLY HAPPENED AND SIMULATED GNP IS WHAT"
00830 PRINT "THE SIMPLE KEYNESIAN MODEL USED IN THIS COMPUTER PROGRAM PREDICTS."
00840 PRINT "DO YOU WANT MORE INFORMATION ",
00850 GOSUB 7390
00860 IF R8=2 THEN 1080
00870 PRINT NEWPAGE
00880 PRINT "EACH YEAR FROM 1929 TO 1949 YOU WILL BE GIVEN RESULTS FROM THIS"
00890 PRINT "AND THEN BE ASKED FOR NEW VALUES OF GOVERNMENT SPENDING AND TAXES,"
00900 PRINT "THE TWO TOOLS OF FISCAL POLICY. AFTER YOU ENTER THESE NUMBERS, I WILL"
00910 PRINT "PRINT A NEW SIMULATED GNP SHOWING THE EFFECTS OF YOUR DECISIONS."
00920 PRINT
00925 IF A7=1 THEN 980
00930 PRINT "I EVALUATE YOUR PERFORMANCE ASSUMING THAT YOUR GOAL IS TO PREVENT"
00940 PRINT "THE DEPRESION. TO DO THIS YOU NEED TO KEEP GNP GROWING BY 3% A YEAR."
00950 PRINT "IF YOU DO NOT STOP THE DEPRESSION, I GIVE YOU SOME HINTS ABOUT HOW "
00960 PRINT "TO STOP IT WHEN YOU FINISH."
00970 PRINT
00980 PRINT "WOULD YOU LIKE INFORMATION ABOUT SPECIAL COMMANDS ",
00990 GOSUB 7390
01000 IF R8=2 THEN 1080
01010 PRINT NEWPAGE
01020 PRINT "THE COMMANDS AVAILABLE ARE :"
01030 GOSUB 7580
01040 PRINT "TO SEE THESE COMMANDS AGAIN DURING THE SIMULATION, TYPE /HELP."
01041 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
01050 ! BEGINNING OF THE SECTION IN WHICH STUDENT MAKES POLICY.********
01080 FOR J=1 TO 12
01090 GOSUB 2200
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01100 GOSUB 2240
01110 Y7=1928+J
01120 PRINT USING 790: Y7,I(J),G(J),T(J),C,Y4,H(J)
01130 PRINT
01140 M$="HOW MUCH SHOULD THE GOVERNMENT SPEND?"
01150 GOSUB 7000
01160 IF R9=4 THEN 440
01170 IF R9=8 THEN 1090
01180 G2=V9
01190 ! NEXT SEVERAL STATEMENTS SEARCH FOR A COMMA IN INPUT STRING IN CASE
01191 ! STUDENT ENTERS BOTH NUMBERS AT ONCE
01200 L=LEN(R$)-1
01210 IF L<2 THEN 1300
01220 FOR L1=2 TO L
01230 IF R$(L1:L1)="," THEN 1260
01240 NEXT L1
01250 GOTO 1300
01260 F9=L1+1
01270 GOSUB 9108
01280 F9=1
01290 IF R9<3 THEN 1340
01300 M$="HOW MUCH SHOULD THE GOVERNMENT TAX?"
01310 GOSUB 7000
01320 IF R9=4 THEN 440
01330 IF R9=8 THEN 1090
01340 T2=V9
01350 PRINT
01360 Y(J+1)=(A+I(J)+G2-B*T2)/(1-B)
01370 C=A+B*(Y(J+1)-T2)
01380 IF Y(J+1)>0 THEN 1420
01390 PRINT "YOUR DECISIONS WOULD RESULT IN A NEGATIVE GNP. I CANNOT ALLOW THAT"
01400 PRINT "LET'S TRY AGAIN."
01410 GOTO 1140
01420 PRINT "YEAR  INVESTI-  GOVERNMENT  TAXES  CONSUMP-  YOUR SIMU-"
01430 PRINT "          MENT     SPENDING          TION     LATED GNP"
01432 ! ********* FORMATED OUTPUT
01440 PRINT USING 790: Y7,I(J),G2,T2,C,Y(J+1)
01445 IF A7=1 THEN 1840
01450 ! GNP HAS BEEN COMPUTED AND PRINTED. NOW THE RATE OF INFLATION AND
01451 ! UNEMPLOYMENT ARE COMPUTED AND ADDITIONAL COMMENTS MAY BE ADDED.
01470 P1=100*P(J)*1.03^J
01480 Y9=Y(J+1)-Y(J)
01490 IF Y9>0 THEN 1520
01500 I4=.3*(Y(J+1)-P1)/P1
01510 GOTO 1530
01520 I4=.35*(Y(J+1)-P1)/P1+.25*Y9/Y(J)
01530 P(J+1)=P(J)+P(J)*I4
01540 U=INT(55*(P1-Y(J+1))/P1+2.5)
01550 I4=INT(100*I4)
01560 IF I4<5 THEN 1660
01570 PRINT "THE RATE OF INFLATION YOU CAUSED WAS";I4;"PERCENT."
01580 IF I4<10 THEN 1650
01581 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$:PRINT NEWPAGE
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


01590 PRINT "A GOOD POLICY MAKER WOULD NOT CAUSE THIS EXCESSIVE INFLATION."
01600 IF I4<15 THEN 1650
01610 PRINT "ARE YOU TAKING THE MULTIPLIER PRINCIPLE INTO ACCOUNT? RECALL"
01620 PRINT "THAT A ONE DOLLAR INCREASE IN GOVERNMENT SPENDING OR A ONE"
01630 PRINT "DOLLAR DECREASE IN TAXES HAS A MULTIPLE EFFECT ON INCOME BECAUSE"
01640 PRINT "IT AFFECTS CONSUMPTION."
01650 G1=G1-.5*I4
01660 IF U<4.5 THEN 1730
01670 PRINT "THE LEVEL OF UNEMPLOYMENT WAS";U;"PER CENT."
01680 IF U<7 THEN 1720
01690 PRINT "THIS LEVEL OF UNEMPLOYMENT IS UPSETTING THE CITIZENS."
01700 IF U<20 THEN 1720
01710 PRINT "THEY ARE RIOTING IN THE STREETS!!"
01720 G1=G1-U
01730 IF ABS(Y(J+1)-P1)/P1>.03 THEN 1750
01740 PRINT "OVERALL YOU DID A GOOD JOB THIS PAST YEAR"
01750 PRINT
01760 IF T2<15 THEN 1780
01770 PRINT "YOUR CITIZENS ARE NOT HAPPY WITH THE LEVEL OF THE TAXES."
01780  D5=G2-T2
01790 IF D5<10 THEN 1840
01800 PRINT "THE GOVERNMENT DEFICIT THAT YOU PRODUCED WAS ";D5
01810 PRINT "MANY NEWSPAPERS EDITORIALS ARE ACCUSING YOU OF FISCAL"
01820 PRINT "IRRESPONSIBILITY. THIS MAY COST YOU VOTES ON ELECTION DAY."
01830 PRINT
01840 NEXT J
01845 IF A7=1 THEN 7550
01850 PRINT "YOUR TERM AS POLICYMAKER HAS ENDED. OVERALL YOUR PERFORMANCE SHOWS"
01860 IF G1<94 THEN 1900
01870 PRINT "AN EXCELLENT UNDERSTANDING OF THE KEYENESIAN MODEL USED IN THIS"
01880 PRINT "SIMULATION. KEEP UP THE EXCELLENT WORK!"
01890 GOTO 7550
01900 IF G1<70 THEN 1940
01910 PRINT "A GOOD UNDERSTANDING OF THIS MODEL, THOUGH IT COULD BE IMPROVED."
01920 PRINT "KEEP UP THE GOOD WORK."
01930 GOTO 7550
01940 IF G1<0 THEN 1980
01950 PRINT "THAT YOUR UNDERSTANDING OF THIS MODEL BORDERS ON THE INADEQUATE."
01960 PRINT "YOU NEED TO STUDY IT MORE."
01970 GOTO 1990
01980 PRINT "THAT YOU DO NOT KNOW WHAT ARE YOU DOING. BETTER HIT THOSE BOOKS!"
01990 PRINT "WOULD YOU LIKE AN EXPLANATION OF A STRATEGY THAT WILL HELP YOUR"
02000 PRINT "PERFORMANCE?"
02010 GOSUB 7390
02020 IF R8=2 THEN 2190
02030 PRINT NEWPAGE
02031 PRINT "YOU WANTED GNP TO INCREASE ABOUT THREE PER CENT A YEAR AFTER 1929,"
02040 PRINT "THE LAST YEAR OF PROSPERITY. THUS IN 1930 YOU WANT GNP TO BE"
02050 PRINT "103.1 * 1.03 OR 106.2, AND IN 1931 YOU WANT IT TO BE 106.2 * 1.03 "
02060 PRINT "OR 109.3. THEN YOU MUST COMPARE THIS TARGET GNP TO THE GNP SIMU-"
02070 PRINT "LATED WITH ACTUAL POLICY. IN 1930, FOR EXAMPLE, YOU HAVE A GAP OF"
02080 PRINT "106.2 - 89.3, OR ALMOST 17. HOW CAN YOU FILL THIS GAP? SINCE EACH"
02090 PRINT "INCREASE OF 1 IN GOVERNMENT SPENDING INCREASES GNP BY 3, WE CAN"
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC -- RELEASE 07
LISTP

02100 PRINT "INCREASE GNP BY 17 WITH 5.67 EXTRA GOVERNMENT SPENDING. A DECISION"
02110 PRINT "TO LET THE GOVERNMENT SPEND 15.2 AND TAX 9.2 WILL GIVE US RESULTS"
02120 PRINT "WE WANT. EACH OTHER YEAR CAN BE WORKED IN THE SAME WAY. TRY IT"
02121 PRINT "AND SEE WHAT HAPPENS. "
02122 INPUT "PRESS C AND ENTER TO CONTINUE": CONT$
02130 PRINT "  THERE ARE ALSO OTHER WAYS TO STABILIZE SIMULATED GNP. YOU CAN"
02140 PRINT "CUT TAXES, OR RAISE BOTH TAXES AND GOVERNMENT SPENDING BY THE SAME"
02150 PRINT "AMOUNT TO TAKE ADVANTAGE OF THE B: ANCED BUDGET MULTIPLIER OF THIS"
02160 PRINT "MODEL. REGARDLESS OF WHAT YOU DO, DO NOT WORRY ABOUT THE LEVEL OF"
02170 PRINT "OF THE DEFICIT. A KEYNESIAN DOES NOT CONSIDER A BIG DEFICIT "
02180 PRINT "UNDESIRABLE WHEN THERE IS WIDESPREAD UNEMPLOYMENT, EVEN THE GENERAL"
02181 PRINT "PUBLIC MAY."
02190  GOTO 7550
02200 PRINT "YEAR  INVEST-  GOVERNMENT  TAXES  CONSUMP-  SIMULATED  HISTORICAL"
02220 PRINT "       MENT      SPENDING          TION      GNP        GNP"
02230 RETURN
02240 Y4=(A+I(J)+G(J)-B*T(J))/(1-B)
02250 C=A+B*(Y4-T(J))
02260 RETURN
07000 PRINT M$
07010 LINPUT R$
07020 GOSUB 9108
07030 IF R9<3 THEN 7370
07040 GOSUB 9844
07050 IF R$(1:2)="/S" THEN 7550
07070 IF R$(1:2)="/H" THEN 7160
07080 IF R$(1:2)="/B" THEN 7180
07090 IF R$(1:2)="/R" THEN 7320
07130 PRINT "I DO NOT UNDERSTAND YOUR ANSWER. DO YOU NEED HELP?"
07140 GOSUB 7390
07150 IF R8=2 THEN 7000
07160 GOSUB 7560
07170 GOTO 7000
07180 IF F6=2 THEN 7260
07190 F6=F6+1
07200 IF J>1 THEN 7230
07210 J=1
07220 GOTO 7240
07230 J=J-1
07240 R9=8
07250 GOTO 7370
07260 PRINT "YOU HAVE ALREADY USED THIS COMMAND TWICE. IWILL NOT LET YOU"
07270 PRINT "USE IT AGAIN BECAUSE I WANT YOU TO BE CAREFUL AND AVOID GUESSING"
07280 PRINT "HOWEVER, I WILL LET YOU RESTART THE ENTIRE SIMULATION."
07290 PRINT "WOULD YOU LIKE TO START OVER ?"
07300 GOSUB 7390
07310 IF R8=2 THEN 7000
07320 R9=4
07330 GOTO 7370
07370 RETURN
07380 ! SUBPROGRAM BELLOW CHECKS FOR YES OR NO ANSWERS
07390 INPUT R$
07400 GOSUB 9844
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC -- RELEASE 07
LISTP


07410 IF R$(1:2)="/S" THEN 7550
07430 IF R$(1:1)="N" THEN 7520
07450 IF R$(1:1)="Y" THEN 7500
07470 PRINT "I DID NOT UNDERSTAND YOUR ANSWER. I ASSUME YOU MEANT TO ANSWER YES."
07480 R8=3
07490 GOTO 7540
07500 R8=1
07510 GOTO 7540
07520 R8=2
07530 ! FLAG R8 IS 1 FOR Y, 2 FOR NO, 3 FOR OTHER
07540 RETURN
07550 STOP
07560 PRINT "I WOULD LIKE YOU TO EITHER ENTER A NUMBER OR ONE OF THESE SPECIAL"
07570 PRINT "COMMANDS:"
07580 PRINT "        /STOP OR /S -- TAKES YOU TO END OF PROGRAM."
07590 PRINT "        /RESTART OR /R -- TAKES YOU TO BEGINNING OF PROGRAM."
07600 PRINT "        /BACK OR /B -- LETS YOU REPEAT A YEAR. (YOU MAY ONLY USE)"
07610 PRINT "                       THIS COMMAND TWICE BECAUSE I WANT TO "
07620 PRINT "                       DISCOURAGE GUESSING AND CARELESSNESS.)"
07630 RETURN
09108 A$="0123456789.+-"
09110 P5=1
09111 ! POSITIVE / NEGATIVE INDICATOR
09112 D5=0
09113 ! DECIMAL YET? INDICATOR
09114 D6=0
09115 ! DECIMAL COUNTER
09116 V9=0
09118 R5=0
09119 ! VALUE YET? INDICATOR
09120 R9=0
09126 FOR H4=F9 TO LEN(R$)
09128 J5=0
09130 J5=J5+1
09132 IF R$(H4:H4)=A$(J5:J5) THEN 9140
09134 IF J5=13 THEN 9200
09136 GOTO 9130
09140 J5=J5-1
09142 IF J5<10 THEN 9170
09144 IF J5>10 THEN 9190
09145 ! HAVE FOUND A DECIMAL
09146 IF D5=1 THEN 9200
09148 D5=1
09150 GOTO 9240
09170 IF D5=1 THEN 9180
09172 V9=V9*10+J5
09173 R5=1
09174 IF V9<9.30 THEN 9240
09176 R9=3
09178 GOTO 9280
09180 D6=D6+1
09181 IF D6<6 THEN 9185
09182 R9=3
```

```
PROGRAM NAME: ECK2
SYSTEM/34 BASIC --- RELEASE 07
LISTP

09183 GOTO 9280
09185 V9=V9+J5/(10¬D6)
09186 R5=1
09187 GOTO 9240
09190 IF H4>1 THEN 9200
09192 IF J5=11 THEN 9240
09194 P5=-1
09196 GOTO 9240
09200 IF R5=0 THEN 9220
09202 R9=1
09203 ! R9=1 MEANS INCOMPLETE NUMBER
09204 GOTO 9280
09220 R9=4
09221 ! MEANS INVALID NUMBER
09222 GOTO 9300
09240 NEXT H4
09280 V9=V9*P5
09300 RETURN
09844 LET A$="ABCDEFGHIJKLM"
09845 LET C$="NOPQRSTUVWXYZ"
09846 B$="ABCDEFGHIJKLM"
09847 D$="NOPQRSTUVWXYZ"
09848 T$=" "
09849 J5=1
09850 FOR H4=1 TO LEN(R$)
09852 IF R$(H4:H4)=" " THEN 9860
09854 I$(J5:J5)=R$(H4:H4)
09856 J5=J5+1
09860 NEXT H4
09862 ! OUTPUT IN I HAS BLANKS REMOVED. NOW TO UPSHIFT
09866 FOR H4=1 TO LEN(T$)
09868 FOR J5=1 TO 13
09870 IF I$(H4:H4)=B$(J5:J5) THEN 9876
09871 IF T$(H4:H4)=D$(J5:J5) THEN 9874
09872 NEXT J5
09873 GOTO 9878
09874 T$(H4:H4)=C$(J5:J5)
09875 GOTO 9878
09876 T$(H4:H4)=A$(J5:J5)
09878 NEXT H4
09880 R$=T$
09998 RETURN
09999 END
```